55-1520-237-23-11

CLEANING AND TEMPORARY PROTECTION
PAINT
SEALANTS
FUSELAGE AND LANDING GEAR
POWERTRAIN
ROTOR BLADES
MAIN ROTOR HUB
TAIL ROTOR HUB
POWERPLANT
FLIGHT CONTROLS
REFERENCES
SPECIAL EQUIPMENT LIST
CONSUMABLE MATERIALS

TECHNICAL MANUAL

AVIATION UNIT AND INTERMEDIATE MAINTENANCE

AIRCRAFT
CORROSION CONTROL MANUAL

UH-60A HELICOPTER

HEADQUARTERS, DEPARTMENT OF THE ARMY

13 MAY 1985

This copy is a reprint which includes current pages from Change 1.

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URGENT

TM 55-1520-237-23-11
TO 1H-60(U)A-23
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CHANGE NO. 1

HEADQUARTERS
DEPARTMENTS OF THE ARMY AND THE AIR FORCE
WASHINGTON, D.C., 4 February 1986

Aviation Unit and Intermediate Maintenance

AIRCRAFT
CORROSION CONTROL MANUAL

UH-60A HELICOPTER

TM 55-1520-237-23-11/TO 1H-60(U)A-23, 13 May 1985, is changed as follows:

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To be distributed in accordance with DA Form 12-31, AVUM and AVIM requirements for UH-60A Helicopter, Utility (BLACKHAWK).

URGENT

WARNING

Personnel performing operations, procedures, and practices which are included or implied in this technical manual shall observe the following warnings. Disregard of these warnings and precautionary information can cause serious injury, death, or aborted mission.

CONSUMABLE MATERIALS

Observe all cautions and warnings on the containers when using consumables. When applicable wear necessary protective gear during handling and use. If a consumable is flammable or explosive, *MAKE CERTAIN* consumable and its vapors are kept away from heat, spark, and flame. *MAKE CERTAIN* helicopter is properly grounded and firefighting equipment is readily available prior to use (TM 55-1500-204-25/1). Make sure used or contaminated consumable materials are disposed of in compliance with applicable regulations.

ELECTRICAL GROUNDING OF THE HELICOPTER

Army regulations require the grounding of the helicopter when doing all fueling and defueling operations. Do not operate helicopter electrical switches except those essential for servicing during fueling and defueling. Do not smoke or use flame during fueling and defueling operations.

HIGH VOLTAGE

There are dangerous voltages in the helicopter. Use extreme care when working with equipment having these voltages.

USE OF FIRE EXTINGUISHERS

When fire extinguishers are used in a confined area, ventilate immediately. Serious injury or death could result if the area is not ventilated or the user does not use a self-contained breathing device.

CARBON MONOXIDE

During cold weather operations when preheating is necessary, all personnel should become acquainted with the various types of heaters and where they are to be used. Be careful of accumulations of carbon monoxide and damage to heat-sensitive equipment.

HYDRAULIC SYSTEMS

There are dangerously high hydraulic system pressures in the helicopter. Use extreme care when working on systems having this pressure.

WARNING

When hydraulic fluid, MIL-H-83282, is decomposed by heating, toxic gases are released. If prolonged contact with mist is likely, wear an appropriate respirator. Prolonged contact with liquid or mist can irritate eyes and skin. Wear rubber gloves when handling fluid. After any prolonged contact of fluid with skin, immediately wash area with soap and water. If fluid contacts eyes, flush immediately with clear water. If fluid is swallowed, do not induce vomiting. Get immediate medical attention.

AC POWER

Before applying ac power to helicopter, make certain that the area around the stabilator is clear of personnel and equipment. Should the stabilator be in any position other than trailing edge fully down, it may reposition automatically to fully down when ac power is applied.

MAIN ROTOR PYLON SLIDING COVER

When opening and closing main rotor pylon sliding cover, keep hands away from sharp edges near track and mat end. Make certain that while closing the cover assembly the forward rollers are seated in their tracks. After the co assembly is locked with the locking latches, lift both right and left sides of the forward portion of the cover to ass the alignment/retaining pins are seated.

Warnings, cautions, and notes are used to emphasize important and critical instructions and are used for following conditions.

WARNING

An operating procedure, practice etc., which, if not correctly followed, could result in personnel injury or loss of life.

CAUTION

An operating procedure, practice, etc., which, if not strictly observed, could result in damage to or destruction of equipment.

NOTE

An operating procedure, condition, etc., which is essential to highlight.

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Dates of issue for original and changed pages are:

Original ..... 1 July 1984

Total number of pages in this manual is 64 consisting of the following:

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Introduction

PURPOSE.

The purpose of the Corrosion Control manual is to provide the Commander and maintenance personnel with necessary information to guide them in inspecting, evaluating, repairing, and preventing corrosion on UH-60A Black Hawk helicopters. It will not include general corrosion control techniques. When these techniques are needed, reference will be made to general aircraft and weapons systems cleaning and corrosion control manuals. TM 55-1500-333-24 and TM 43-0105 shall be used as a guide in organizing a preventive maintenance program for corrosion control.

SCOPE.

This manual is divided into ten Sections and three appendixes:

Section 1 contains information on cleaning and temporary protection, includes waterwash techniques and guidance on protecting the helicopter during maintenance, and reviews paint requirements for corrosion control.

Section 2 contains information on paint removal and painting corroded areas.

Section 3 covers sealing compounds and sealing procedures used on the helicopter.

Sections on corrosion-prone areas. These sections are generated by field inputs and includes areas where corrosion has been found, a discussion of material changes to reduce corrosion, damage limits, treatment, and final finish to further protect the area.

Appendix A lists publications referenced throughout this manual.

Appendix B lists special tools necessary for corrosion control referred to in this manual.

Appendix C lists consumable supplies referred to in this manual.

The manual is one of a set of 17 separate manuals that cover maintenance and operating instructions for the model UH-60A helicopters. The helicopters are manufactured by Sikorsky Aircraft, Division of United Technologies Corporation, Stratford, Connecticut 06601. The 17 manuals are:

Operator's Manual	TM 55-1520-237-10
10 Hour/14 Day Inspection Checklist	TM 55-1520-237-PMS-1
Periodic Inspection Checklist	TM 55-1520-237-PMS-2
Wiring Data Manual	TM 55-1520-237-23-1
Aircraft General Information Manual	TM 55-1520-237-23-2
Aircraft Fault Isolation Procedures Manual	TM 55-1520-237-23-3
Maintenance Task Manual, Servicing, Ground Handling, Air Transportability, and General Maintenance	TM 55-1520-237-23-4
Maintenance Task Manual, Airframe and Landing Gear	TM 55-1520-237-23-5
Maintenance Task Manual, Powerplant, Fuel, and Related Systems	TM 55-1520-237-23-6
Maintenance Task Manual, Powertrain	TM 55-1520-237-23-7
Maintenance Task Manual, Hydraulics and Flight Controls	TM 55-1520-237-23-8
Maintenance Task Manual, Electrical and Instruments	TM 55-1520-237-23-9
Maintenance Task Manual, Structural Repair	TM 55-1520-237-23-10
Maintenance Task Manual, Corrosion Control	TM 55-1520-237-23-11
Avionics General Information Manual	TM 11-1520-237-23-1
Avionics Fault Isolation Procedures Manual	TM 11-1520-237-23-2
Maintenance Task Manual Avionics	TM 11-1520-237-23-3

The Operator's Manual, TM 55-1520-237-10 contains operating procedures for the helicopter.

The Inspection Checklists, TM 55-1520-237-PMS-1 and -PMS-2, contains areas of inspection and intervals of scheduled maintenance for the helicopter.

These manuals contain maintenance data for Aviation Unit Maintenance (AVUM) and Aviation Intermediate Maintenance (AVIM) support levels. They do not have depot level maintenance instructions.

The Wiring Data Manual, TM 55-1520-237-23-1, has wire lists and general wiring repair instructions for the entire helicopter.

The General Information Manuals, TM 55-1520-237-23-2 and TM 11-1520-237-23-1, contain descriptions and theories of operation of helicopter systems and major components. The Aircraft General Information Manual covers the entire helicopter, except for avionics systems. The Avionics General Information Manual covers only avionics.

The Task Manuals, TM 55-1520-237-23-4 throu and TM 11-1520-237-23-3, have information f maintenance specialist to do specific mainte tasks. The manuals are individual, self-containe task-oriented. A separate manual covers each except for the helicopter repairman, MOS 67T. maintenance tasks in each manual and therefore a complete set of Task Manuals.

The Fault Isolation Procedures Manuals, TM 55 237-23-3 and TM 11-1520-237-23-2, have da troubleshooting the helicopter's systems. Opera checkout procedures and logic-type troublesh charts give detailed step-by-step instructions to tify malfunctioning components. Component lo diagrams and schematics are also included. Th craft Fault Isolation Procedures Manual covers a copter systems except for avionics. The Avionics Isolation Procedures Manual covers only avionics

Section 1

CLEANING AND TEMPORARY PROTECTION

NOTE

Paragraphs 1.1 or 1.2 will be followed if the helicopter has been exposed to salt spray or similar corrosive environments.

1.1. Waterwash-manual: Waterwashing the helicopter is an effective way of preventing corrosion. Wash helicopter using procedures in TM 55-1520-237-23-4 and TM 55-1500-333-24. Frequency of waterwash will depend on severity of environment and the length of time the helicopter was exposed to it.

1.2. Water rinse-automated: The water rinse is an immediate action requiring little time. Local directives and local facilities shall be used for water rinse operation. The helicopter should be ground taxied, or towed through the rinse area. Make sure that rinse coverage is complete.

1.3. Temporary protection:

1.3.1. Temporary protection is necessary when the helicopter has parts removed for maintenance that expose otherwise protected parts or areas. Immediate temporary protection is also necessary to prevent additional damage to accident-damaged helicopter. Each case must be evaluated separately, as no two situations are exactly alike.

1.3.2. Use TM 43-0105 as a guide in protecting exposed metal parts. Procedures in TM 55-1520-237-23-4 for storing helicopters should be used as a guide to protect crash-damaged helicopters that must be stored outside shelter. In some cases these referenced procedures will not be enough, and the final solution must be based on the ingenuity of the responsible authority, even to the extent of building temporary shelter around the helicopter.

1.4. Emergency cleaning procedures:

1.4.1. Immediate action must be taken if helicopter has been submerged, or partly submerged in salt water, or if it has been exposed to fire extinguishing agents, such as foam or purple K. This will prevent corrosion damage that will happen if helicopter is not maintained. Follow emergency procedures in TM 55-1500-333-24 and TM 43-0105.

Section 2

PAINT

2.1. Paint removal: Paint, or organic coatings, is one of the most important ways of protecting metal surfaces from corrosion. Repainting and replacing protective coatings when they are deteriorated, chipped, or worn is vital to the prevention of corrosion. Breaks in organic coatings are almost impossible to avoid. Therefore, great care must be taken in applying and maintaining coatings. If paint is softened, cracked, chipped, or its adhesive bond is broken, the best defense against corrosion is lost. Maintain protective coatings by touchup. When protective coatings have deteriorated or when corrosion deposits have accumulated and hardened enough to require drastic cleaning procedures, or when corrosion evidence is found, recondition surface and restore protective coating(s). The more frequently a coated surface (such as a painted surface) is thoroughly cleaned, the easier it will be to clean and keep free of corrosion.

2.2. Painting: Prepare surfaces for painting, or touch up painting per TB 746-93-2. Procedures for painting aircraft surfaces may be found in TB 746-93-2. Paints to use for touchup application on the UH-60A helicopter are listed in TM 55-1520-237-23-10.

2.3. Final finish: Painting requirements stated in this manual are minimum acceptable for corrosion control. Additional touchup or top coats may be applied as desired.

Section 3

SEALANTS

3.1. Types of sealants: The primary sealant for the UH-60A helicopter is sealing compound, MIL-S-8802. Wet primer, Fed. Spec TT-P-1757 is applied to fasteners to assist in sealing fastener holes. See applicable UH-60A maintenance manuals for types of sealing compounds.

3.2. Sealing procedures: For general application of sealing compounds, refer to TM 43-0105. For sealing during maintenance of systems, refer to applicable UH-60A maintenance manuals.

Section 4

FUSELAGE AND LANDING GEAR

4.1. General: Corrosion-prone areas in fuselage and landing gear are mainly standard steel hardware, steel parts that are exposed to weather, or, on internal parts, where water has leaked on them. Corrosion appears as a red film, followed by pitting. Corrosion on windshield wiper pivot pin has been reduced by changing the material from 4130 steel to 17-4PH CRES steel, beginning with helicopter serial No. 83-23842. Corrosion in floor holddown screws has been traced to moisture being trapped under the tiedown studs by the shims bonded to the bottom on the steel pans which form part of the floor. Present floors may be improved by slotting these shims so the moisture will not be trapped (see paragraph 4.5.4.). The drag beam pivot pin has had additional coats of primer, MIL-P-23377, applied to its internal bore. The tail landing gear fork retaining ring was cadmium-plated and dichromate-dipped, starting with helicopter serial No. 79-23265. Blade stowage support fitting material was changed from alloy steel (MIL-S-5000) to PH13-8MO CRES starting with helicopter serial No. 80-23509. Exterior paint was changed to polyurethane, MIL-C-46168, starting with helicopter serial No. 82-23755. Fuselage skin overlaps are being sealed with sealing compound, MIL-S-8802, and all skin rivets were installed coated with wet sealing compound, starting with helicopter serial No. 84-23933. Paint on interior cabin surfaces was changed from zinc chromate primer, TT-P-1757, to epoxy primer, MIL-P-23377, and tub interior was sprayed with corrosion preventive compound, MIL-C-85054 (Amlguard), starting with helicopter serial No. 84-23933.

CAUTION

To avoid drag beam failure, do not rework areas other than those described.

4.2. Classification: Critical characteristics are defined by the helicopter manufacturer. Damage limits must not be exceeded under any circumstance. Parts described in this section either do not have critical characteristics, or their critical characteristics are not affected by procedures given in this section.

4.3. Damage limits:

4.3.1. Damage limits on standard hardware (hardware with AN, MS, and NAS part numbers) are in Table 4-2. It is recommended that corroded standard hardware be replaced, if possible, rather than reworked, as the cadmium plating on this hardware will be removed by rework.

4.3.2. Corrosion on drag beam exterior surface is limited to surface discoloration. Replace drag beam if pits are visible after hand polishing. Damage limits for drag beam are for external surface only. Do not attempt to repair inside of drag beam. Replace drag beam if any discoloration or breaks in baked resin coating are found.

4.3.3. See Figure 4-1 for damage limits on drag beam pivot pin. Rework must not cause dimensions shown in Figure 4-1 to be exceeded.

4.3.4. There is no damage limit for blade support pole attach fittings. Rework these fittings as necessary until blade support poles will no longer fit securely in fittings.

4.3.5. Tail landing gear fork retaining ring may be reworked provided damage limits are not exceeded.

4.3.6. Replace latch on forward pylon sliding cover when nut is loose, or wobbles on thread. On non-threaded areas, replace latch when pits are greater than 0.005 inch after rework.

4.3.7. See Table 4-2 for the rest of damage limits on fuselage and landing gear area.

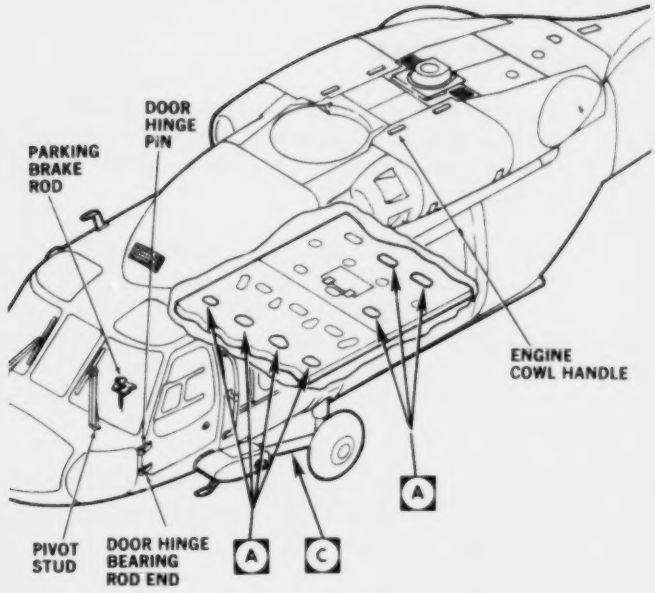
4.4. Inspection methods:

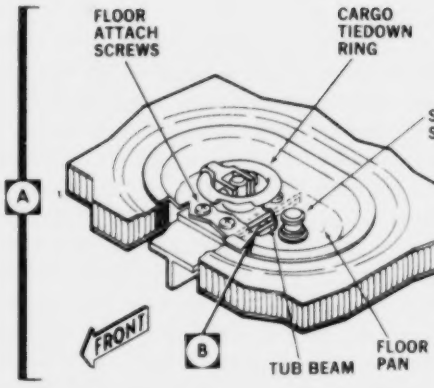
4.4.1. When removing floor panels, check area under cargo tiedown rings for evidence of water entrapment, such as stains or corrosion. Check nutplates on floor beam for evidence of corrosion.

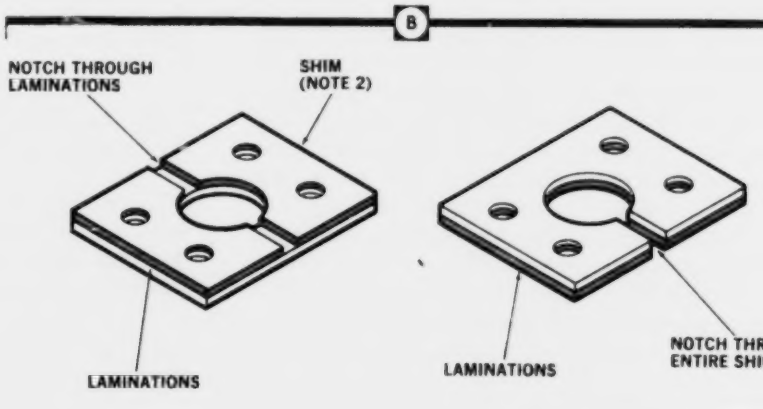
4.4.2. Inspect for corrosion visually, using procedures in TM 43-0105.

4.5. Corrosion removal/treatment:

4.5.1. Remove paint and loose corrosion as necessary, using procedures in TB 746-93-2. Be careful not to go beyond damage limits in paragraph 4-3 and Table 4-2. Mix corrosion removing compound, MIL-C-10578,







NOTES

1. SHIMS SHOWN REMOVED FROM FLOOR PAN FOR CLARITY.
2. SHIM SHOWN UPSIDE DOWN. NONLAMINATED PORTION IS BONDED TO FLOOR PAN.

S 82035.1 (B)

Figure 4-1 (Sheet 1 of 2)

with an equal volume of water to make diluted solution. After applying solution, rinse treated area thoroughly with clear water.

4.5.2. Drag beam corrosion:

CAUTION

Damage limits for drag beam are based on hand-polishing corrosion. Machine grinding will go beyond damage limits, and is cause to reject the drag beam.

Remove corrosion from external surface of drag by hand polishing with 320-grit abrasive P-C-451.

4.5.3. When removing corrosion from rod end corrosion removing compound, make sure com does not get into bearing. Mask bearings as requi

4.5.4. After removing floor panels, make a sl inch wide by 1/8 inch deep across the laminate bonded to the floor pan to allow the water to (Figure 4-1). Use hacksaw to score laminations peeling them to make slot.

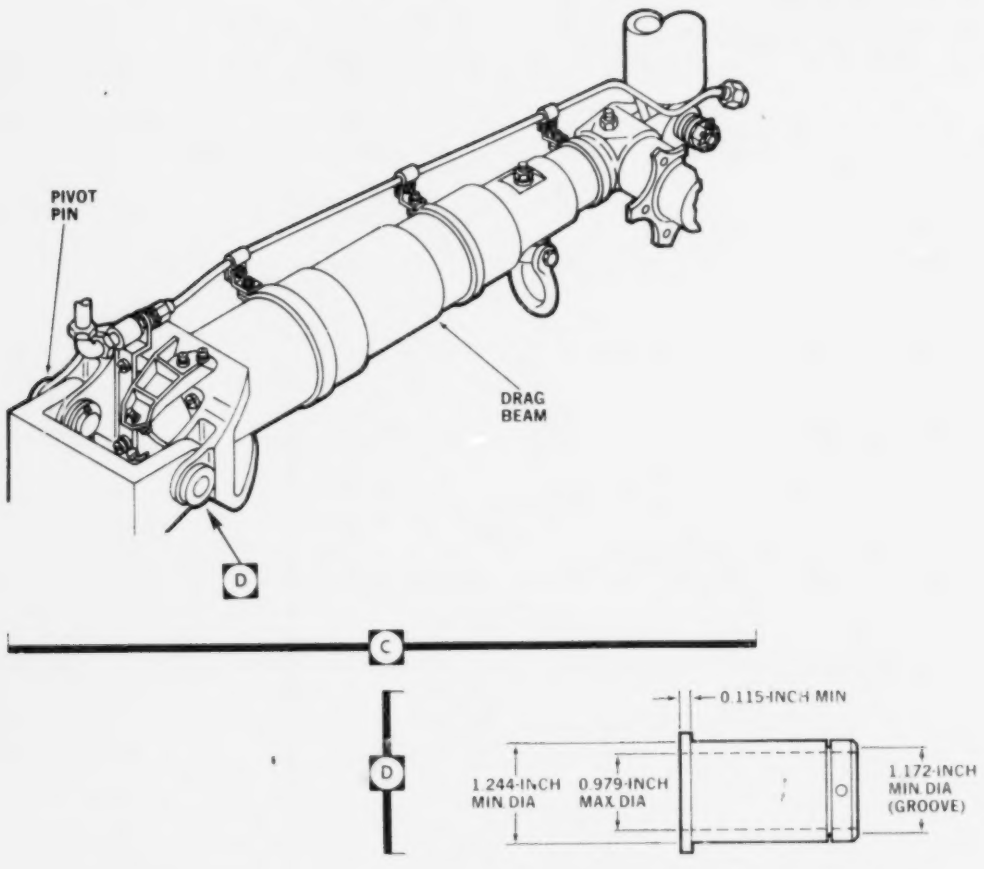


Figure 4-1 (Sheet 2 of 2)

4.6. Sealants:

4.6.1. Sealing compound and sealing procedures are in the maintenance task manuals for the parts affected by this section. Refer to them for proper sealing procedures when reinstalling parts.

4.6.2. Do not apply sealing compound to underside of shims when reinstalling floors. Apply primer, Fed. Spec TT-P-1757, to threads and area under heads of floor attachment screws before installing them. Cover heads of screws securing floor pans to floor beam with sealing compound, MIL-S-8802, after installation.

4.7. Finishes:

4.7.1. Refer to TM 55-1520-237-23-10 for finishes used on helicopter. Refer to TB 746-93-2 for touchup procedures.

4.7.2. Touchup paint tail landing gear fork retaining ring with primer, MIL-P-23377, after reinstalling it on fork.

4.7.3. Touchup paint shim with primer, Fed Spec TT-P-1757.

4.7.4. Touchup paint nonmating surfaces of drag beam pivot pin both before and after installation.

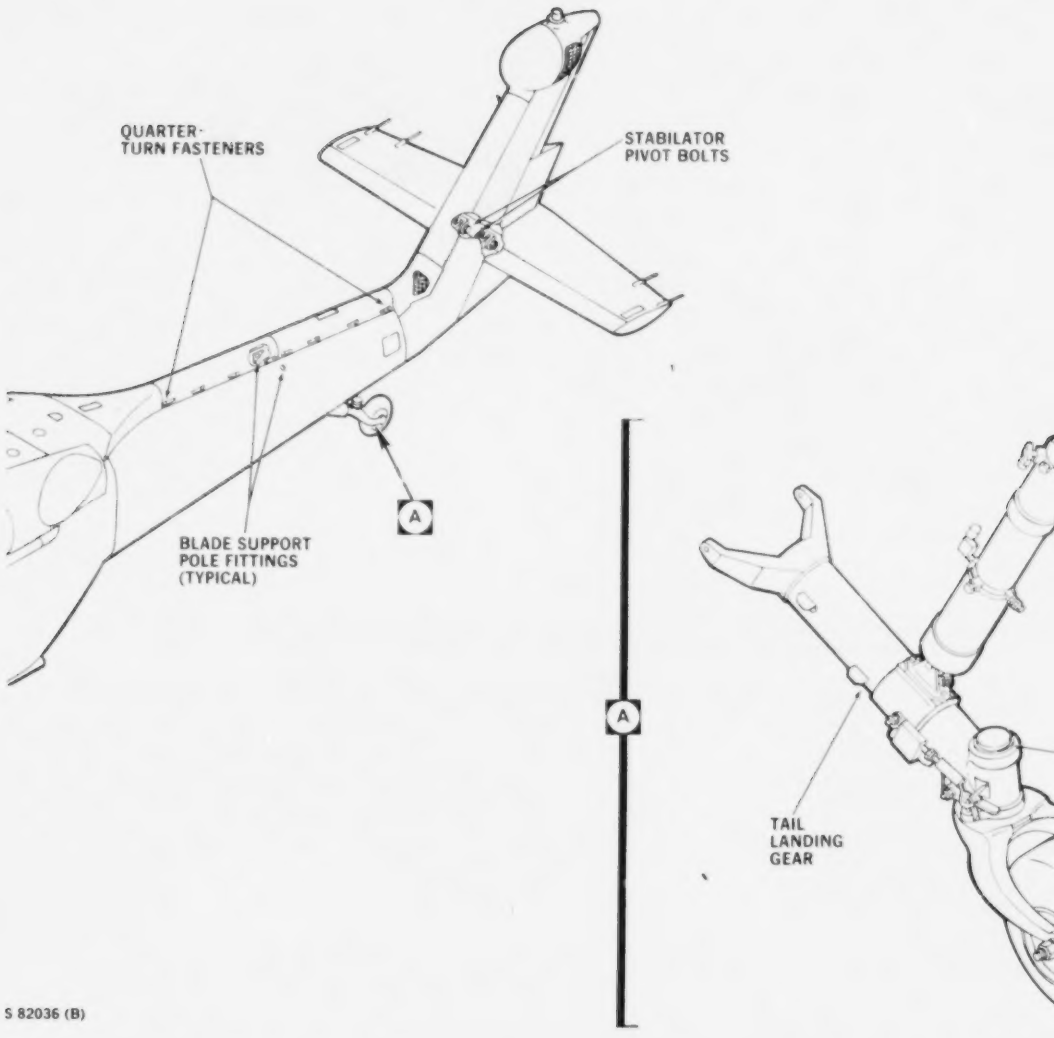

QUARTER-
TURN FASTENERS
STABILATOR
PIVOT BOLTS
A
BLADE SUPPORT
POLE FITTINGS
(TYPICAL)
A
TAIL
LANDING
GEAR
S 82036 (B)

Figure 4-2

Table 4-1. Corrosion Inspection

Index No.	Area/Item Nomenclature	Material Identification	Corrosion Appearance	Probable Cause
1	AN, MS, NAS standard hardware	Alloy steel or aluminun	Red film or white dust	Environmental
2	Door hinge bearing rod end	4130 steel MIL-S-6756	Red film, pits	Environmental
3	Windshield wiper pivot stud	4130 steel MIL-S-18729	Red film	Environmental
4	Parking brake rod	4130 Cond C steel MIL-S-6756	Red film	Environmental
5	Floor attach screws	Cadmium-plated steel	Red film	Water entrapment
6	Drag beam pivot pin	4340 Cond C steel MIL-S-8844	Red film	Environmental
7	Drag beam	300M forging MIL-S-8844	Red film, pits	Environmental
8	Engine cowl handle	4130 steel MIL-S-18729	Red film, pits	Environmental
9	Blade support pole fittings	Alloy steel MIL-S-5000 or PH13-8MO CRES steel	Red film	Environmental
10	Quarter-turn fasteners		Red film	Environmental
11	Engine cowling hinge bolts	Alloy steel	Pits	Environmental
12	Stabilator pivot bolt	Alloy steel	Red film	Environmental
13	Stabilator fitting (right side)	17-4 PH CRES steel	Red film	Environmental
14	Cargo tiedown rings and floor pans	Custom 455 steel AMS5617	Pits	Environmental
15	Tail landing gear fork retaining ring	Carbon spring steel MIL-S-46049 (cadmium-plated with dichromate dip)	Red film, pits	Environmental
16	Piano and pin type hinges	Alloy steel	Red film, pits	Environmental
17	Latch and retainer (sliding pylon and nose door)	Alloy steel	Red film, pits	Environmental

Table 4-2. Corrosion Removal and Repair

Index No.	Area/Item Nomenclature	Damage Limit	Repair Procedure
1	AN, MS, NAS standard hardware	Visible pits over 0.005 in. deep after rework	Remove corrosion manually; then diluted corrosion removing compo MIL-C-10578, to steel parts
2	Door hinge bearing rod end	Bearing sticking or ratchety	Remove corrosion manually; then diluted corrosion removing compo MIL-C-10578
3	Windshield wiper pivot stud	Pits greater than 0.050 in diameter on wearing surface	Remove rust manually; then apply corrosion removing compound, M 10578
4	Parking brake rod	Pits deeper than 0.050 inch, or rust too deep to be removed	Remove rust manually; then apply corrosion removing compound, MI 10578
5	Floor attach screws	Visible pits over 0.050 inch deep after rework	Replace screws, and slot shims per paragraph 4.5.4
6	Drag beam pivot pin	See Figure 4-1	Manually remove surface corrosion out minor pits
7	Drag beam	Visible pits after rework	Hand-polish surface with 320-grit aluminum oxide abrasive cloth, P-(
8	Engine cowl handle	Pits greater than 0.015 in. deep	Remove rust manually; then apply corrosion removing compound, MI 10578
9	Blade support pole fittings	None	Remove rust manually; then apply corrosion removing compound, MI 10578
10	Quarter-turn fasteners	Inoperative fastener	Remove rust manually (see paragra 4.3); then apply diluted corrosion removing compound, MIL-C-1057
11	Engine cowling hinge bolts	Visible pits after rework	Remove rust manually
12	Stabilator pivot bolt	Pits greater than 0.010 in.	Remove rust manually
13	Stabilator fitting (right side)	Pits greater than 0.050 in.	Remove corrosion manually using p NSN 7920-00-659-9175; then apply diluted corrosion removing compou MIL-C-10578

Table 4-2. Corrosion Removal and Repair (Cont)

Index No.	Area/Item Nomenclature	Damage Limit	Repair Procedure
14	Cargo tiedown rings and floor pans	Pits in weld area greater than 0.010 inch, or pitting covers more than 25% of weld area after cleanup	Remove corrosion manually; then apply diluted corrosion removing compound, MIL-C-10578
15	Tail landing gear fork retaining ring	0.108-inch minimum thickness 0.264-inch minimum width	Remove corrosion manually, blend out pits
16	Piano and pin type hinges	Pits greater than 0.005 in. after rework	Remove corrosion with pad, NSN 7920-00-659-9175; then apply diluted corrosion removing compound, MIL-C-10578
17	Latch and retainer (sliding pylon and nose door)	See paragraph 4.3.6	Remove corrosion with pad, NSN 7920-00-659-9175; then apply diluted corrosion removing compound, MIL-C-10578

Table 4-3. Sealant System

Index No.	Area/Item Nomenclature	Repair Procedure
1	AN, MS, NAS standard hardware	Coat door pins with molysulfide lubricant oil, DOD-L-25681 Seal heads of bolts and nuts with sealing compound, MIL-S-8802
3	Windshield wiper pivot stud	Seal area where pivot stud is mounted on canopy with MIL-S-8802
4	Parking brake rod	Coat rod with corrosion removing compound, MIL-C-16173, Type II
5	Floor attach screws	In accordance with TM 55-1520-237-23-5
12	Stabilator pivot bolt	Coat bolt with corrosion removing compound, MIL-C-16173, Type II
16	Piano and pin type hinges	Coat hinge pins with molysulfide lubricant oil, DOD-L-25681

Table 4-4. Finish System

Index No.	Area/Item Nomenclature	Material Identification	Original Pretreatment	Touchup Repair or Repair Pretreatment	Primer	Top C
1	AN, MS, NAS standard hardware	Alloy steel, aluminum	Alodine per MIL-C-5541		2 coats MIL-P-23377	None
2	Door hinge bearing rod end	4130 steel MIL-S-6756	None		2 coats MIL-P-23377	Aircraf green M C-4616
3	Windshield wiper pivot pin	See 4.1	Wash primer MIL-C-8514		MIL-P-23377	Color #3703 MIL-C 19538
4	Parking brake rod		None		None	
6	Drag beam pivot pin	4340 Cond C steel MIL-S-8844	Sulfamate		MIL-P-23377	
7	Drag beam	300M forging MIL-S-8844		None		
8	Engine cowl handle	4130 steel MIL-S-18729	None	None	MIL-P-23377	MIL-C 46168
10	Quarter-turn fasteners	Alloy steel	None	None	MIL-P 23377	MIL-C 46168
13	Stabilator fitting (right side)	17-4 PH CRES steel		None	MIL-P-23377	MIL-C 46168
14	Cargo tiedown rings and floor pans	Custom 455 steel	Passivated	None	MIL-P-23377	
15	Tail landing gear fork retaining ring	Carbon spring steel MIL-S-46049	Oil dip, or cadmium-plate with dichromate dip	Clean with MEK		See Paragr 4.7.2
17	Latch and retainer (sliding pylon and nose door)	Alloy steel		None	2 coats MIL-P-23377	MIL-C 46168

Section 5

POWERTRAIN

5.1. General: Corrosion prone areas in the powertrain are the magnesium module housings, the intermediate and tail gear boxes and drive shaft hardware. See TM 43-0105 for corrosion appearance on magnesium castings. Corrosion on drive shaft hardware appears as red film and pits on spherical washers and nuts. Corrosion on housings is largely due to chipping of protective finishes, and not enough sealing of mating surfaces of modules. Tail drive shaft corrosion is found on spherical washers and the nuts that hold flanges on gear boxes and oil cooler. The drive shaft spherical washer material has been changed from 440C steel to 17-4 PH CRES steel, starting with helicopter serial No. 83-23872.

5.2. Classification: Critical characteristics are defined by the helicopter manufacturer. Damage limits must not be exceeded under any circumstance.

CAUTION

To avoid main rotor shaft failure, rework only areas authorized by maintenance manual. Do not rework areas where baked resin coating is applied.

5.2.1. The main rotor shaft described in this section has coverage and thickness of baked resin coating as a critical characteristic. Rework of main rotor shaft is restricted to procedures in TM 55-1520-237-23-7, and as stated in paragraph 5.3.

5.2.2. Other than as stated above, there are no parts with critical characteristics, or with critical characteristics that are affected by procedures in this section.

5.3. Damage limits:

CAUTION

To avoid main rotor shaft failure, rework only areas where authorized.

5.3.1. Reparable damage on main rotor shaft ID is limited to the 4.260-inch-diameter area, which is the upper 2.71 inches of shaft (Figure 5-1) where pits up to 0.010 inch deep may be reworked. See TM 55-1520-237-23-7 for disposition instructions if pits greater than 0.010 inch deep are found in this area, or if there is visible corrosion any other place on ID of shaft.

5.3.2. Damage on flange nut is limited to pits less than 0.030 inch deep on all areas except threads. Pitting shall not cover more than 10% of the mating surface of the nut. Replace nut if there is corrosion on threads or corrosion on rest of nut greater than limits.

5.3.3. No corrosion is allowed on spherical washers.

5.3.4. Replace gear box if corrosion on housings is greater than 0.015 inch. Replace gear box if any corrosion is found on mounting lugs.

5.4. Inspection methods: Visually inspect parts, using procedures in TM 43-0105.

5.5. Corrosion removal/treatment:

5.5.1.

CAUTION

To avoid oil contamination, and possible gear box damage, do not soak cloth with corrosion removing compound so that compound drips off cloth.

Clean ID of main rotor shaft with a clean cloth moistened with corrosion removing compound, MIL-C-10578, Type II. Rinse area with cloth moistened with water. Manually remove corrosion from authorized areas of shaft, using procedures in TM 43-0105.

5.5.2. Do not attempt to remove corrosion from tail rotor drive shaft spherical washers. Replace corroded washers.

5.5.3. Remove paint and blend out pits in gear box housings, using procedures in TM 55-1520-237-23-7.

CAUTION

To avoid flange nut failure, do not attempt to remove corrosion from threads. If threads are corroded, replace nut.

5.5.4. Manually remove corrosion pits from flange nuts, using procedures in TM 43-0105.

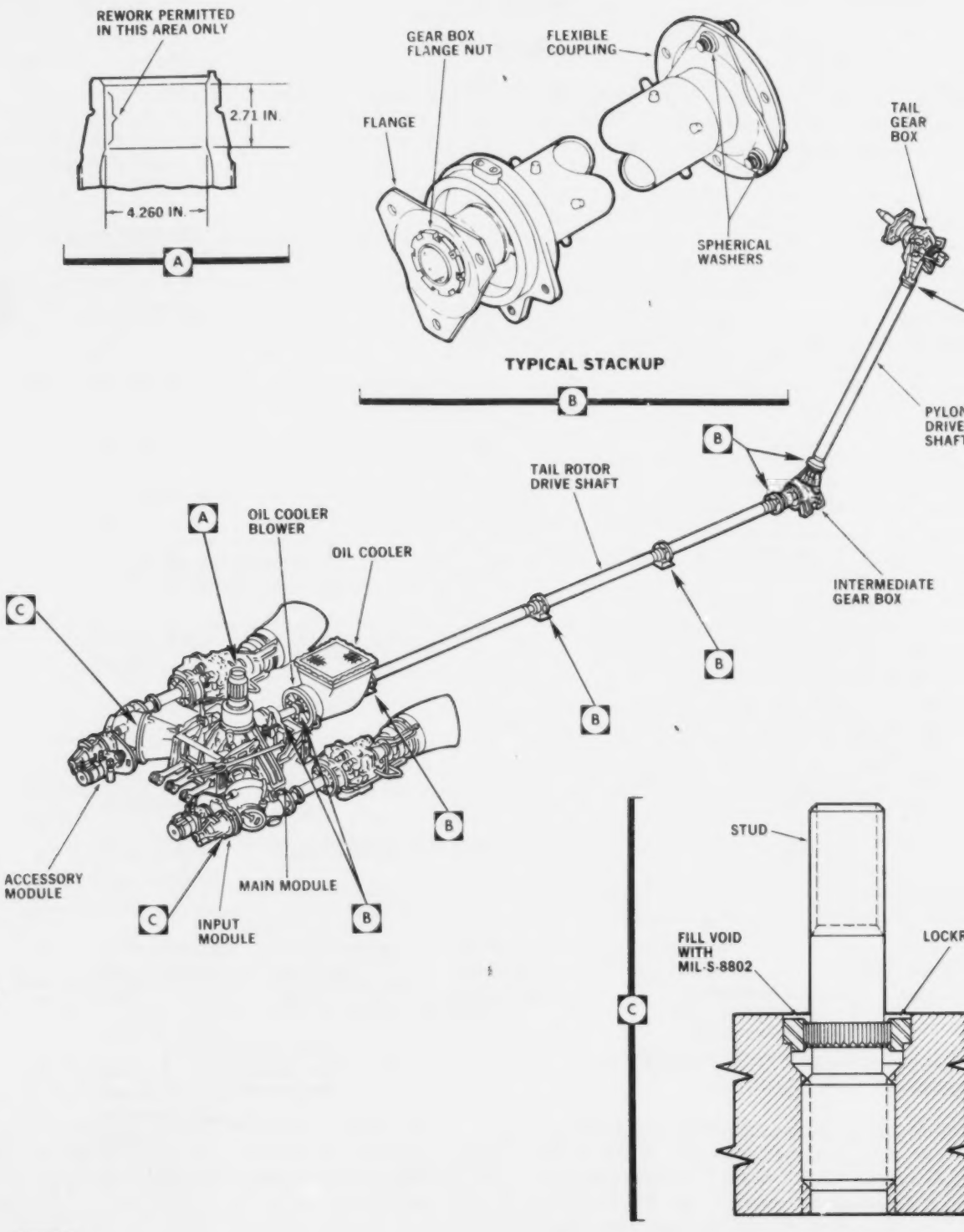


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Figure 5-1

5.6. Sealants:

5.6.1. Seal main rotor shaft and head per TM 55-1520-237-23-7.

5.6.2. When installing hydraulic modules on accessory module, or accessory module on input module, or input module on main module, seal mating areas by doing this:

5.6.2.1. Clean mating surfaces with methyl ethyl ketone, Fed. Spec TT-M-261, or solvent, O-T-620. Touch up magnesium surfaces with chemical conversion coating, MIL-M-3171, Type VI, per TM 43-0105.

5.6.2.2. Fill void between inserts and edge of modules with sealing compound, MIL-S-8802.

CAUTION

To avoid contaminating transmission oil system, do not apply primer to bore diameters that are sealing surfaces for packings.

5.6.2.3. Just before installing module, apply primer, MIL-P-23377, to mating surfaces and fasteners holes. Install and torque module per maintenance manuals, within 1/2 hour of applying primer. Allow extra primer to squeeze out of joint.

5.6.2.4. Seal all seams with sealing compound, MIL-S-8802.

NOTE

The above procedure must be done whenever the joints between hydraulic modules, accessory modules, input modules and main transmission are disturbed, for any reason.

5.7. Finishes:

5.7.1. See TM 55-1520-237-23-7 for touchup paint information of main, accessory, and input modules, and intermediate and tail gear boxes.

5.7.2. Paint flats and exposed face of gear box flange nut with primer, MIL-P-23377. Do not paint threads or mating surface of nut.

Table 5-1. Corrosion Inspection

Index No.	Area/Item Nomenclature	Material Identification	Corrosion Appearance	Probable Cause
1	Main rotor shaft	4340 norm & tmp steel	Blistering on resin coating	Trapped moisture
2	Gear box flange nut		Red film, pits	Scratches in silver plate
3	Tail drive shaft spherical washer	440C CRES AMS 5619 or 17-4 PH CRES	Red film, pits	Environmental
4	Main module	Magnesium	Pitting	Chipped paint
5	Accessory module	Magnesium	Pitting	Chipped paint
6	Input module	Magnesium	Pitting	Chipped paint
7	Intermediate gear box	Magnesium	Pitting	Chipped paint
8	Tail gear box	Magnesium	Pitting	Chipped paint

Table 5-2. Corrosion Removal and Repair

Index No.	Area/Item Nomenclature	Damage Limit	Repair Procedure
1	Main rotor shaft	Pits greater than 0.010 inch on 4.260 inch dia area (see paragraph 5.3)	Apply corrosion removing compour MIL-C-10578. Blend out pits where allowed per TM 43-0105.
2	Gear box flange nut	See 5.3.2	Blend out corrosion per TM 43-010
4	Main module	See 5.3.4	Blend out corrosion per TM 55-152 23-7
5	Accessory module	See 5.3.4	Blend out corrosion per TM 55-152 23-7
6	Input module	See 5.3.4	Blend out corrosion per TM 55-152 23-7
7	Intermediate gear box	See 5.3.4	Blend out corrosion per TM 55-152 23-7
8	Tail gear box	See 5.3.4	Blend out corrosion per TM 55-152 23-7

Table 5-3. Sealant System

Index No.	Area/Item Nomenclature	Repair Procedure
1	Main rotor shaft	Reseal with MIL-S-8802 per TM 55-1520-237-23-7
4	Main module	Install with wet primer, MIL-P-23377; then seal with MIL-S-88
5	Accessory module	Install with wet primer, MIL-P-23377; then seal with MIL-S-88
6	Input module	Install with wet primer, MIL-P-23377; then seal with MIL-S-88

Table 5-4. Finish System

Index No.	Area/Item Nomenclature	Material Identification	Original Pretreatment	Touchup Repair or Repair		
				Pretreatment	Primer	Top Coat
2	Gear box flange nut	Steel AMS 6381	Silver plated	Brush-cad-plate	MIL-P-23377	
4	Main module	Magnesium	Dow 17	See TM 55-1520-237-23-7		
5	Accessory module	Magnesium	Dow 17	See TM 55-1520-237-23-7		
6	Input module	Magnesium	Dow 17	See TM 55-1520-237-23-7		
7	Intermediate gear box	Magnesium	Dow 17	See TM 55-1520-237-23-7		
8	Tail gear box	Magnesium	Dow 17	See TM 55-1520-237-23-7		

Section 6

ROTOR BLADES

6.1. General: Rotor system corrosion is found mostly on standard hardware used on the blades. This corrosion is caused by chipping of protective finishes on main rotor blade cuff attach bolts, and by erosion on tip cap surfaces. Entrapped moisture causes corrosion on the main rotor blade balance weights and tip cap balance weights. Tail rotor blade corrosion is limited to bushings on pitch change horns. Tip cap screw material is being changed from alloy steel to A286 CRES.

6.2. Classification: Critical characteristics are defined by the helicopter manufacturer. Damage limits must not be exceeded under any circumstance. There are no parts with critical characteristics, or whose critical characteristics are affected by procedures in this section.

6.3. Damage limits:

6.3.1. Main rotor blade cuff attach bolts may have up to 0.005 inch of base metal (under plating) removed to remove corrosion.

6.3.2. Replace tip cap attach screws and tip block attach screws if there is any sign of corrosion (TM 55-1520-237-23-10).

6.3.3. Main rotor blade balance weights and tip cap balance weights may have up to 0.005 inch of base metal (under plating, or paint, depending on finish) removed to remove corrosion.

6.3.4. Tail rotor pitch horn bushing corrosion limits are found in TM 55-1520-237-23-7.

6.4. Inspection methods:

6.4.1. Inspect the main rotor blade cuff attach bolts (exposed areas only), tip cap, and tip block attach screws visually for corrosion, using procedures in TM 43-0105.

6.4.2. Inspect pitch horn bushings per TM 55-1520-237-23-7.

6.5. Corrosion removal/treatment:

6.5.1. Repair main rotor blade cuff attach bolts and nuts (exposed areas only), balance weights and tip cap balance weights by polishing area until corrosion and pits are removed, taking care not to go beyond damage limitations in paragraph 6.3.

6.5.2. Repair tail rotor pitch horn bushings per TM 55-1520-237-23-7.

6.6. Sealants:

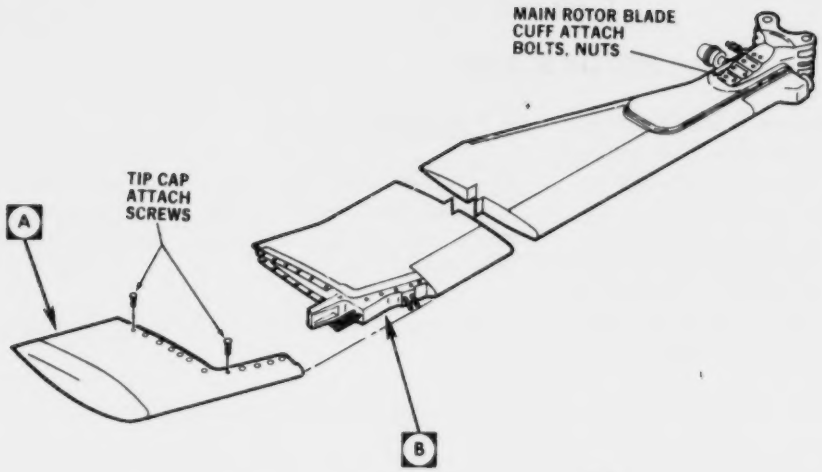
6.6.1. To seal main rotor blade cuff attach bolts and nuts, do this:

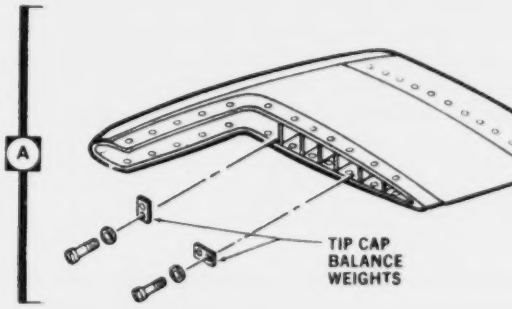
CAUTION

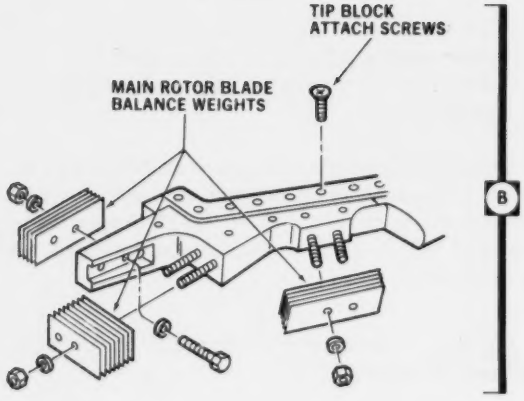
To keep from damaging cuff, do not allow plating solution to contact cuff. If it does, remove plating solution immediately.

Brush-cadmium-plate polished areas per MIL-STD-865. If brush-cadmium-plating equipment is not available, apply 2 coats of primer, MIL-P-23377. Apply sealing compound, MIL-S-8802, to area around boltheads and nuts as required.

6.7. Finishes: Touch up areas per TM 55-1520-237-23-10 and TB 746-93-2.







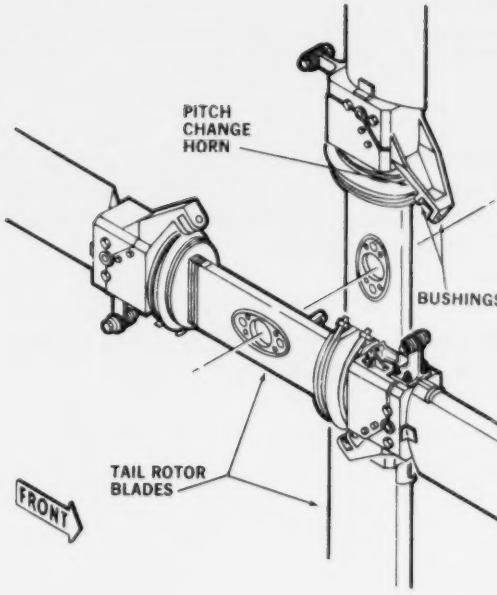


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Figure 6-1

Table 6-1. Corrosion Inspection

Index No.	Area/Item Nomenclature	Material Identification	Corrosion Appearance	Probable Cause
1	Main rotor blade cuff attach bolts, nuts	Alloy steel	Rust, pits	Erosion and chipping of protective finishes
2	Main rotor blade tip cap attach screws	Alloy steel or A286 CRES (AMS 5737)	Rust, pits	Erosion and chipping of protective finishes
3	Main rotor blade tip block attach screws	Alloy steel	Rust, pits	Erosion and chipping of protective finishes
4	Main rotor blade balance weights	Tungston, Type 2, MIL-T-21014 cadmium-plated (0.0003 in. thick); or Cad-plated steel (4130 Cond A or N with 0.0003 in. thick plating)	Bubbled paint, pits	Entrapped moisture in tip cap area
5	Main rotor blade tip cap balance weights	Cadmium-plated steel (4130, Cond A or N plated 0.0003 in. thick)	Bubbled paint, pits	Entrapped moisture in tip cap area
6	Tail rotor pitch change horn bushings	Cad-plated steel (4130)	Rust, pits	Erosion and chipping of protective finishes

Table 6-2. Corrosion Removal and Repair

Index No.	Area/Item Nomenclature	Damage Limit	Repair Procedure
1	Main rotor blade cuff attach bolts, nuts	Pits no greater than 0.005 inch in base metal	Remove all sealing compound from area around corrosion. Remove corrosion by blending with 220-grit abrasive cloth and pad, NSN 7920-00-659-9175
4	Main rotor blade balance weights	Pits no greater than 0.005 in. in base metal	Remove primer from weights (TB 746-93-2). Remove corrosion by blending with 220-grit abrasive cloth
5	Main rotor blade tip cap balance weights	Pits no greater than 0.005 in. in base metal	Remove primer from weights (TB 746-93-2). Remove corrosion by blending with 220-grit abrasive cloth
6	Tail rotor pitch change horn bushings	See TM 55-1520-237-23-7	See TM 55-1520-237-23-7

Table 6-3. Sealant System

Index No.	Area/Item Nomenclature	Repair Procedure
1	Main rotor blade cuff attach bolts, nuts	Brush-cadmium-plate blended area per MIL-STD-865, or ap coats of primer, MIL-P-23377. Clean area around end of bol methyl ethyl ketone, Fed. Spec TT-M-261. Completely cove bolts with MIL-S-8802
6	Tail rotor pitch change horn bushings	Install and seal per TM 55-1520-237-23-7

Table 6-4. Finish System

Index No.	Area/Item Nomenclature	Material Identification	Original Pretreatment	Touchup Repair or Repair Pretreatment	Primer	To
5	Main rotor blade tip cap balance weights	Cad-plated steel		None	MIL-P-23377 or TT-P-1757	Non requ

Section 7

MAIN ROTOR HUB

7.1. General: Corrosion on main rotor hub is found on the bifilar washers, main rotor shaft nut, droop stop springs, pins, and hardware, and antiflap stop springs and hardware, pitch change rod end bearings, and spindle attach bolts and washers. Material and wet environmental conditions are responsible for corrosion found on bifilar washers, rod end bearings, and springs. Corrosion found on the chamfer of the spindle attach bolts is because not enough primer was applied to bolts at installation. Corrosion found on the heads of these bolts is entirely due to lack of protective coating (paint) at installation. Mast nut corrosion is due to a combination of not enough protection at installation, condensation inside the shaft extension, and a leaking bifilar cover. Corrosion on main rotor hub parts appears as a reddish film followed by pits as corrosion becomes more severe. Plating of bolts has been changed from silver to cadmium to improve corrosion resistance. This change has been retrofitted onto all Black Hawk helicopters. The entire area around the interior of the main rotor shaft extension has been sprayed with corrosion preventive compound. The material of the droop stop springs was changed from cadmium-plated music wire to stainless steel, starting with helicopter serial No. 80-23464. The pitch change rod bearing balls were changed from 440C stainless steel (AMS 5643) to PH13-8 MO (AMS 5629) starting with helicopter serial No. 81-23579. Retrofit of springs and pitch change rod end bearings will be by attrition.

7.2. Classification: Critical characteristics are defined by the helicopter manufacturer. Damage limits must not be exceeded under any circumstance. There are no parts with critical characteristics, or whose critical characteristics are affected by procedures in this section.

7.3. Damage limits:

7.3.1. Corrosion damage limits for pitch change rod end bearings, bifilar washers, main rotor shaft nut, and spindle attach bolts are found in TM 55-1520-237-23-7.

7.3.2. Any visible corrosion on head of antiflap stop attach bolt, antiflap stop spring, or droop stop spring and attaching hardware is cause for that part to be replaced.

7.4. Inspection methods: Visually inspect areas concerned using procedures in TM 43-0105.

7.5. Corrosion removal/treatment: Remove corrosion from parts described in this section per TM 55-1520-237-23-7.

7.6. Sealants:

7.6.1. Seal main rotor shaft nut per TM 55-1520-237-23-7.

7.6.2. Seal spindle attach bolts per TM 55-1520-237-23-7.

7.7. Finishes:

7.7.1. Touch up paint reworked areas per TB 746-93-2, and TM 55-1520-237-23-7.

7.7.2. Spray corrosion preventive compound, MIL-C-85054, Type I, inside shaft extension and on mast nut before installing bifilar cover.

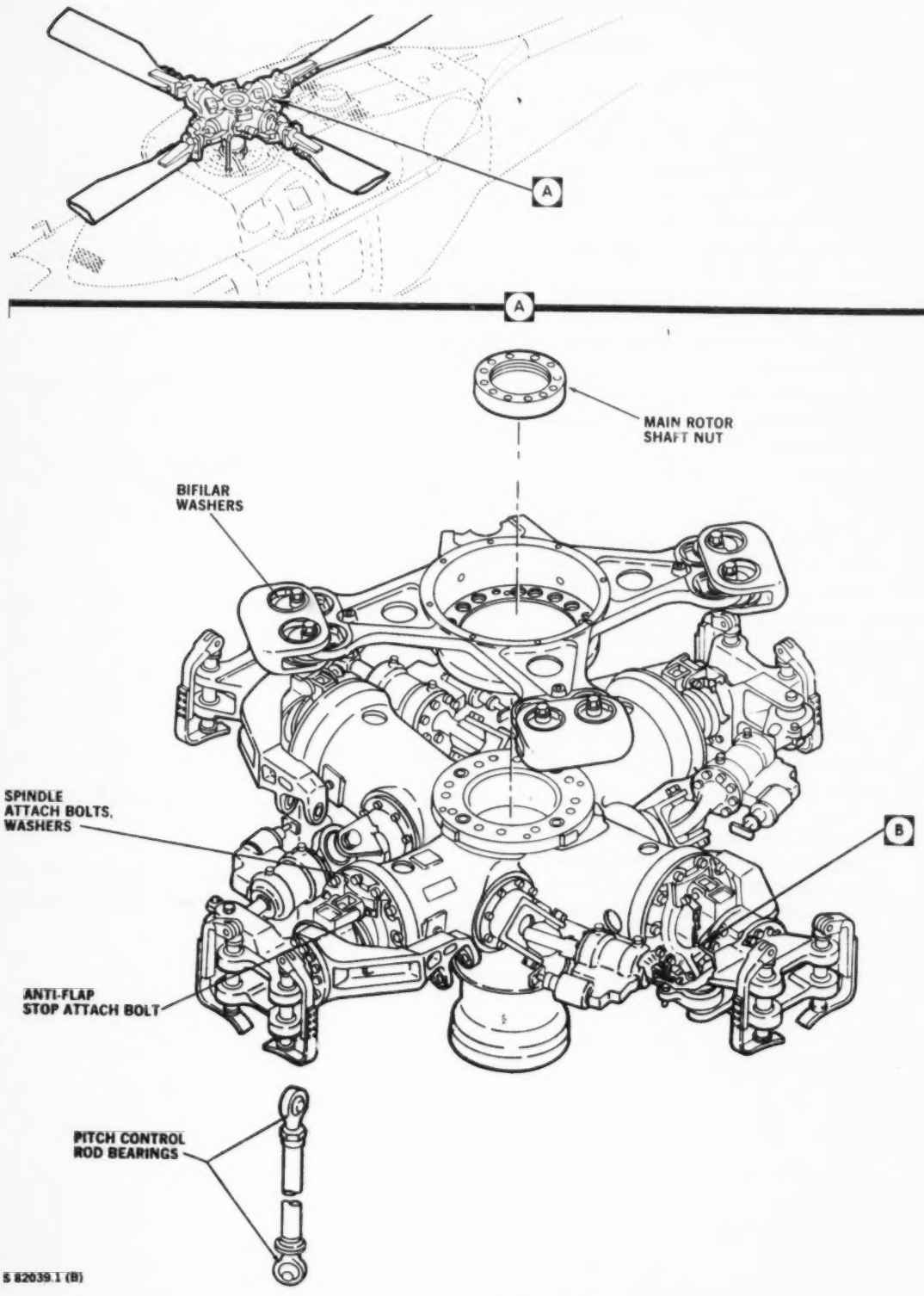

Figure 7-1 (Sheet 1 of 2)

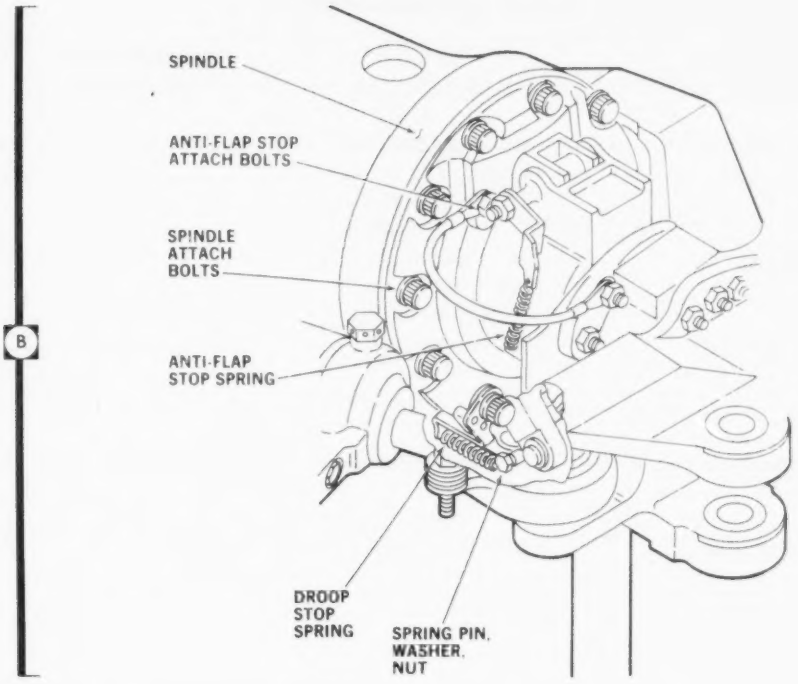

Figure 7-1 (Sheet 2 of 2)

Table 7-1. Corrosion Inspection

Index No.	Area/Item Nomenclature	Material Identification	Corrosion Appearance	Proba Cau
1	Pitch control rod end spherical bearings	440C stainless steel (AMS 5643), or PH13-8MO (AMS 5629)	Red film, pits	Environme
2	Bifilar washers	440C Cond A steel (QQ-S-763)	Red film, pits	Environme
3	Main rotor shaft nut	17-7 PH-ANN steel (MIL-S-25043)	Red film, pits	Improper b sealing, wa entrapmen
4	Antiflap stop attach bolts	Cadmium-plated alloy steel	Red film, pits	Environme
5	Droop stop springs, pins, hardware	Cadmium-plated music wire Stainless steel Alloy steel	Red film	Environme
6	Antiflap stop spring	Cadmium-plated music wire Stainless steel	Red film	Environme
7	Spindle attach bolts, washers	Alloy steel	Red film, pits	Improper protection, installation

Table 7-2. Corrosion Removal and Repair

Index No.	Area/Item Nomenclature	Damage Limit	Repair Procedure
1	Pitch control rod end bearings	See TM 55-1520-237-23-7	See TM 55-1520-237-23-7
2	Bifilar washers	See TM 55-1520-237-23-7	See TM 55-1520-237-23-7
3	Main rotor shaft nut	See TM 55-1520-237-23-7	See TM 55-1520-237-23-7
7	Spindle attach bolts	See TM 55-1520-237-23-7	See TM 55-1520-237-23-7

Table 7-3. Sealant System

Index No.	Area/Item Nomenclature	Repair Procedure
2	Bifilar washers 70107-08047-101	Lubricate per TM 55-1520-237-23-4
3	Main rotor shaft nut 70103-08005-041	Reinstall per TM 55-1520-237-23-7
7	Spindle attach bolts, washers	Reinstall per TM 55-1520-237-23-7

Table 7-4. Finish

See TM 55-1520-237-23-7 for touchup requirements.

Section 8

TAIL ROTOR HUB

8.1. General: Tail rotor hub corrosion is found on pitch control rod ends, rod end bearings, and on jamnuts. This corrosion appears as a reddish film on surface of the item, followed by pits as corrosion becomes more severe. Corrosion is caused by entrapped moisture inside boots installed on rod ends, and unprotected metal where boots do not extend. Rod ends are made from AMS 5659 forgings. Bearings are made from 440C stainless steel (AMS 5643). Jamnuts are cadmium-plated steel. Boots were originally installed to exclude moisture, but were removed beginning with helicopter serial No. 83-23852.

8.2. Classification: Critical characteristics are defind by the helicopter manufacturer. Damage limits must not be exceeded under any circumstance. There are no parts with critical characteristics, or whose critical characteristics are affected by procedures in this section.

8.3. Damage limits: See Table 8-2.

8.4. Inspection methods: Visually inspect areas concerned using procedures in TM 43-0105.

8.5. Corrosion removal/treatment:

8.5.1. Remove corrosion manually using pad, NSN 7920-00-659-9175 on rod end and jamnut.

8.5.2. See TM 55-1520-237-23-7 for corrosion removal and treatment of rod end bearing.

8.6. Sealants: None required.

8.7. Finishes: Mask rod end bearing and threads. Apply two coats of primer, MIL-P-23377 to rod end and jamnut. Do not allow paint to get into bearing, or on threads.

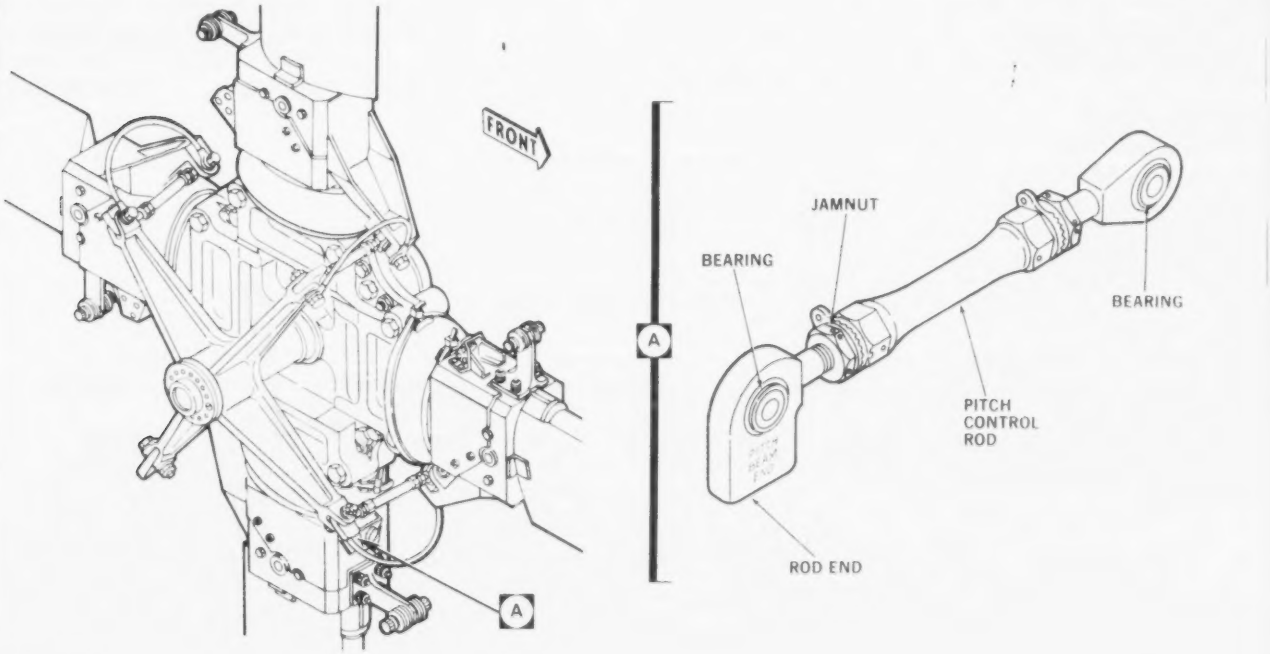

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Figure 8-1

Table 8-1. Corrosion Inspection

Index No.	Area/Item Nomenclature	Material Identification	Corrosion Appearance	Probable Cause
1	Tail rotor pitch control rod end	Forging (AMS 5659)	Red film	Environment
2	Tail rotor pitch control rod bearing	440C stainless steel (AMS 5643)	Red film, pits	Environment
3	Jamnut	Steel with 0.0003 in. thick cadmium-plate	Red film, pits	Environment

Table 8-2. Corrosion Removal and Repair

Index No.	Area/Item Nomenclature	Damage Limit	Repair Procedure
1	Tail rotor pitch control rod end	Pits greater than 0.005 in. deep	Clean corrosion with pad, NSN 7920-0 659-9175
2	Tail rotor pitch control rod bearing	See TM 55-1520-237-23-7	See TM 55-1520-237-23-7
3	Jamnut	5 or more corrosion pits on any single flat	Clean corrosion with pad, NSN 7920-0 659-9175

Table 8-3. Sealant System

None required

Table 8-4. Finish System

Index No.	Area/Item Nomenclature	Material Identification	Original Pretreatment	Touchup Repair or Repair		
				Pretreatment	Primer	Top C
1	Tail rotor pitch control rod end	Forging, AMS 5659	None	None	2 coats MIL-P-23377	None require
3	Jamnut	Steel with 0.0003 in. cad-plate	None	None	2 coats MIL-P-23377	None require

Section 9

POWERPLANT

9.1. General: Corrosion in this area is primarily found on aft engine mounts, hardware, and on load demand spindle (LDS) rod end and bearings. This corrosion is caused by wet environmental conditions. Corrosion on these parts first appears as a reddish film, followed by pits as corrosion becomes more severe. NAS 464 series bolts were used on engine mount struts prior to helicopter serial No. 82-23684, and were changed to NAS 6705 and NAS 6706 on serial Nos 82-23685 and subsequent. This was done primarily to reduce wear.

9.2. Classification: Critical characteristics are defined by the helicopter manufacturer. Damage limits must not be exceeded under any circumstance. There are no parts with critical characteristics, or whose critical characteristics are affected by procedures in this section.

9.3. Damage limits: See Table 9-2 for damage limits on fittings, struts, and hardware after rework. Corrosion damage in bearing balls is limited to less than five pits visible in a 1/2-inch diameter, and pits must be no larger than 0.050 inch. Limits on bolts are minimum unthreaded shank diameter (see Table 9-2).

9.4. Inspection methods: Inspect parts visually using procedures in TM 43-0105.

9.5. Corrosion removal/treatment:

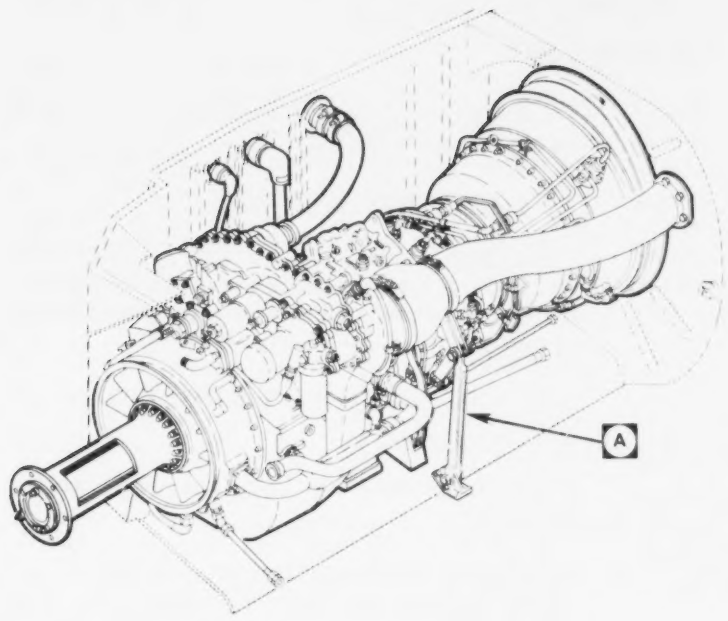
9.5.1. Clean fittings and struts using pad, NSN 7920-00-659-9175, being careful not to exceed damage limits. Clean reworked areas with corrosion removing compound, MIL-C-10578, Type II.

9.5.2. Clean bearings with pad, NSN 7920-00-659-9175.

9.5.3. Clean LDS rod end with pad, NSN 7920-00-659-9175.

9.6. Sealants: After installing LDS cable rod end, seal threads extending past the nut with sealing compound, MIL-S-8802.

9.7. Finishes: Apply two coats of primer, MIL-P-23377, to reworked area on struts, and LDS rod end fitting. Touch up paint LDS rod end fitting per TB 746-93-2. Coat threads of rod end with lubricating oil, MIL-L-23699, after installation.



A

ENGINE MOUNT BOLT LOCATION

1. NAS464P5-12 OR NAS6705DU14
2. NAS464P5-17 OR NAS6705DU18
3. NAS464P6-24 OR NAS6705DU26
4. NAS624-8

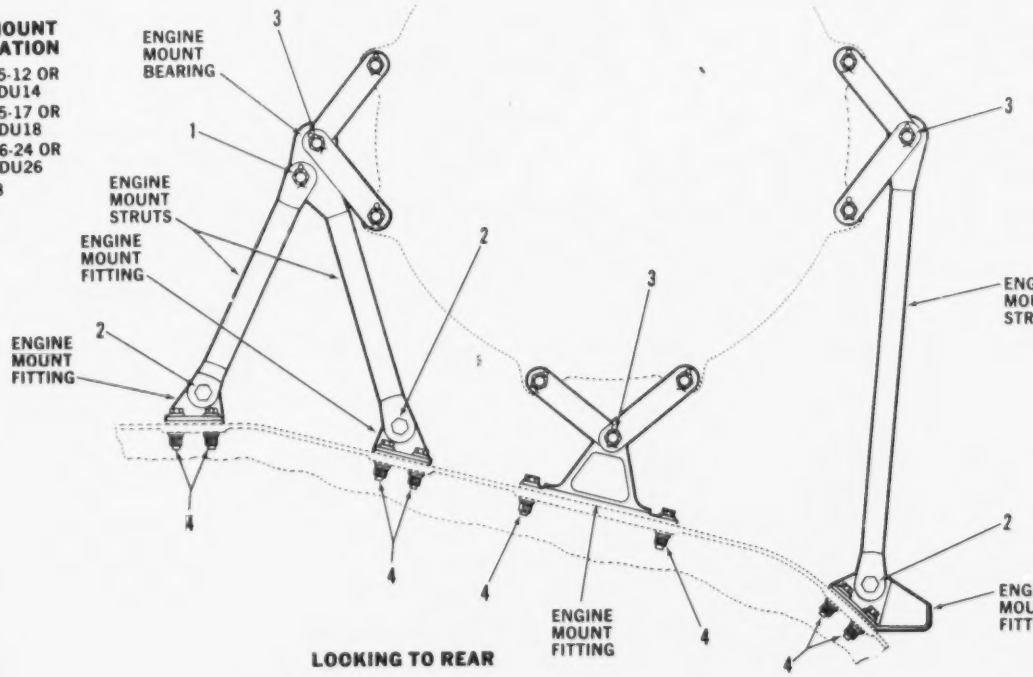


Figure 9-1

Table 9-1. Corrosion Inspection

Index No.	Area/Item Nomenclature	Material Identification	Corrosion Appearance	Probable Cause
1	LDS cable rod end	321 Cond A steel (QQ-S-763)	Reddish film	Environmental
2	Engine mount fittings	17-4 PH CRES steel (AMS 5355)	Red to red-brown film	Environmental
3	Engine mount struts	4340 steel forging (MIL-S-5000)	Pits, red film	Environmental
4	Engine mount bearings	440C steel (AMS 5630)	Red to red-brown film, pits	Environmental
5	Engine mount bolts (NAS 464)	Cadmium-plated (0.0003 in. thick) steel	Pits	Environmental
5	Engine mount bolts (NAS 624)	Cadmium-plated (0.0003 in. thick) alloy steel	Pits	Environmental
5	Engine mount bolts (NAS 6705 and 6706)	Cadmium-plated (0.0003 in. thick) A826 steel (AMS 5736)	Pits	Environmental

Table 9-2. Corrosion Removal and Repair

Index No.	Area/Item Nomenclature	Damage Limit		Repair Procedure
1	LDS cable rod end			Polish with scouring pad, NSN 7920-659-9175
2	Engine mount fittings	Pits greater than 0.010 inch deep		Blend out pits manually with pad, NS 7920-00-659-91 /5
3	Engine mount struts	Pits greater than 0.010 inch deep		Blend out pits manually with pad, NS 7920-00-659-9175
4	Engine mount bearings	Pits larger than 0.050 inch and/or more than 5 pits in 1/2 inch diameter area		Clean corrosion from surface
5	Engine mount bolts (NAS 464)	Bolt No.	Min Dia	Clean corrosion from surface
		NAS464P5-17	0.3108	
		NAS464P5-12	0.3108	
		NAS464P6-24	0.3733	
5	Engine mount bolts (NAS 624)	NAS624-8	0.2485	Clean corrosion from surface
5	Engine mount bolts (NAS 6705 and 6706)	NAS6705DU14	0.3115	Clean corrosion from surface
		NAS6705DU18	0.3115	
		NAS6706DU06	0.3740	

Table 9-3. Sealant System

Index No.	Area/Item Nomenclature	Repair Procedure
1	LDS cable rod end	Apply MIL-S-8802 to exposed threads to seal against corrosion

Table 9-4. Finish System

Index No.	Area/Item Nomenclature	Material Identification	Original Pretreatment	Touchup Repair or Repair		
				Pretreatment	Primer	Top C
1	LDS cable rod end	Stainless steel 321 Cond A (QQ-S-763)	Passivated	Metal conditioner MIL-C-10578, Type II	2 coats MIL-P-23377	None required
3	Engine mount struts	4340 steel (MIL-S-5000			2 coats MIL-P-23377	None required

Section 10

FLIGHT CONTROLS

10.1. General: Flight control system corrosion is found on areas where components are directly exposed to weather, and on standard hardware. This corrosion is caused by water seeping between bushing and attaching hardware, and in some instances, by condensation inside hollow flight control rods. The flight control system consists of flight control rods made from either steel or aluminum tubing, bellcranks made from either steel or aluminum forgings, and bearings made from steel. Corrosion on steel flight control rods appears as red film on unpainted areas, followed by pits as corrosion becomes more severe. Red film will appear around swaged inserts, and from under rivet heads when these steel inserts are corroding. See TM 55-1500-342-23 for appearance of both steel and aluminum corrosion. The first indication of corrosion on bellcrank bushings is rust being washed out of the bushing and staining the bellcrank. Corrosion appears on the bushing itself as a red film, followed by pits as it becomes more severe. The paint applied to these rods has been changed from MIL-L-46159 lacquer to MIL-C-46168 aliphatic polyurethane, beginning with helicopter serial No. 84-23933.

10.2. Classification: Critical characteristics are defined by the helicopter manufacturer. Damage limits must not be exceeded under any circumstance.

10.2.1. Some control rods and bellcranks described in this section have critical characteristics. No repair is allowed to an area where a critical characteristic is present, and will be affected by the repair. The following list does not give all critical characteristics of the section; it only gives those that may be affected by corrosion repair.

10.2.2. Primary servo to bridge control rods (Index No. 13, Table 10-1) have surface finish as part of their critical characteristics. No damage beyond the paint finish is allowed. No repair other than to the protective finish is allowed.

10.2.3. The tie rod support (Index No. 15, Table 10-1) has edge thickness and width of lugs as a critical characteristic. No rework other than paint finish repair allowed in this area. See Figure 10-1 for exact location.

10.2.4. Forward and lateral bellcranks (Detail G, Figure 10-1) have edge thickness of lower lugs as critical characteristics. No rework other than paint finish repair is allowed. See Figure 10-1 for exact location of areas.

10.2.5. Aft bellcrank (Index No. 18, Table 10-1) has edge thickness of lugs as a critical characteristic. No rework other than paint finish repair is allowed in these areas. See Figure 10-1 for exact location of areas.

10.3. Damage limits:

10.3.1. Replace aluminum control rods if internal corrosion cannot be cleaned with small arms cleaning equipment, or if it extends in a band more than 30% around ID, or if there are external pits greater than 0.010 inch deep.

WARNING

To avoid control rod failure, do not attempt to rework areas where there are critical characteristics which will be affected by rework.

10.3.2. Replace steel control rods if there are corrosion pits greater than can be readily blended out with emery cloth. Replace steel control rods if there is any evidence of looseness between either insert and tube, or if there is any evidence of rust bleeding out from between insert(s) and tube. Replace rod ends if corrosion pits are greater than 0.010 inch deep.

10.3.3. Replace control rods and fittings which have SS4045 and/or 70400-08107-110 bushings installed in ends if pits on bushings are deeper than 0.030 inch, or if pitting is greater than 50% of the reamed bore area.

10.3.4. Replace torque tube bearing support if there is pitting deeper than 0.030 in area of mounting lugs. See TM 55-1520-237-23-8 for accept/reject criteria on torque tube bearings.

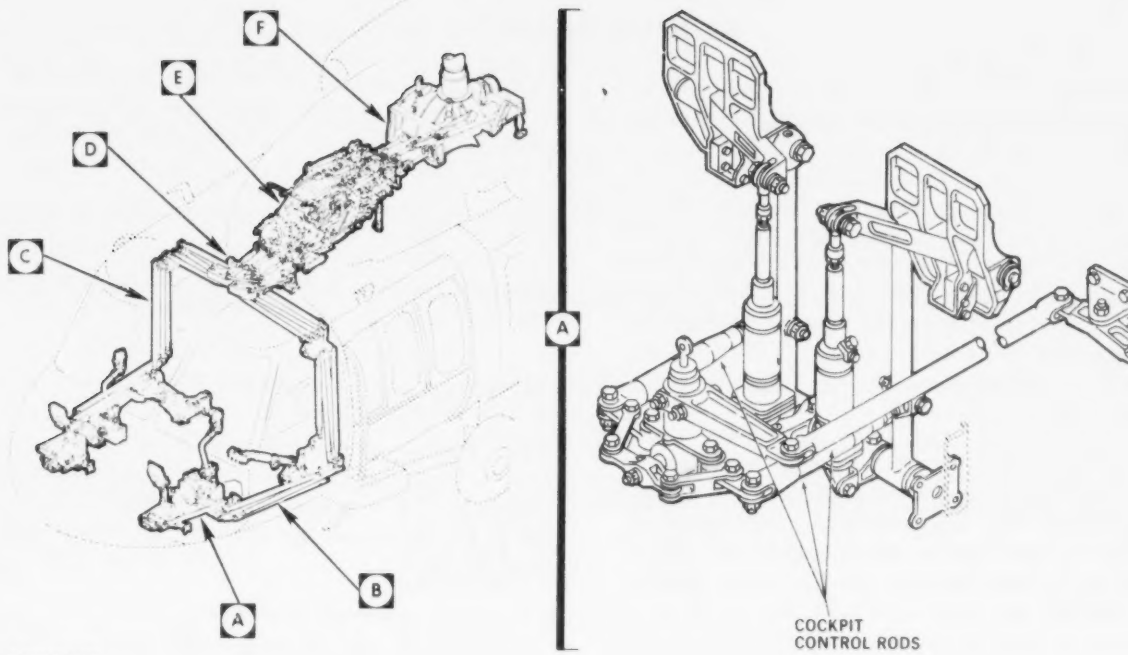


Figure 10-1 (Sheet 1 of 4)

10.3.5. Replace self-retaining bolt, 70400-08159-101 through -108, if isolated pits are greater than 0.010 inch. Replace bolt, 70400-08159-101 through -106, if overall unthreaded shank diameter (from head to beginning of threads) is less than 0.7472 inch after rework. Replace bolt, 70400-08159-107 and -108 if overall unthreaded shank diameter (from head to beginning of threads) is less than 0.8722 inch after rework. See Table 10-2 for limitations on self retaining flight control bolts. Use corrosion criteria on Table 4-2 for damage limits on standard hardware.

WARNING

To avoid flight control failure, do not attempt to rework areas where there are critical characteristics which will be affected by rework.

10.3.6. Replace flight control bellcranks if pi greater than 0.040 inch.

10.4. Inspection methods:

10.4.1. Visually inspect control rods using proce in TM 55-1500-342-23. Inspect interior areas of a able control rods by removing adjustable end using an engine borescope.

10.4.2. Visually inspect remainder of flight co system using procedures in TM 43-0105.

NOTE

Corrosion on bellcrank bushings will normally be seen as "bleed out" of rust from underneath boltheads.

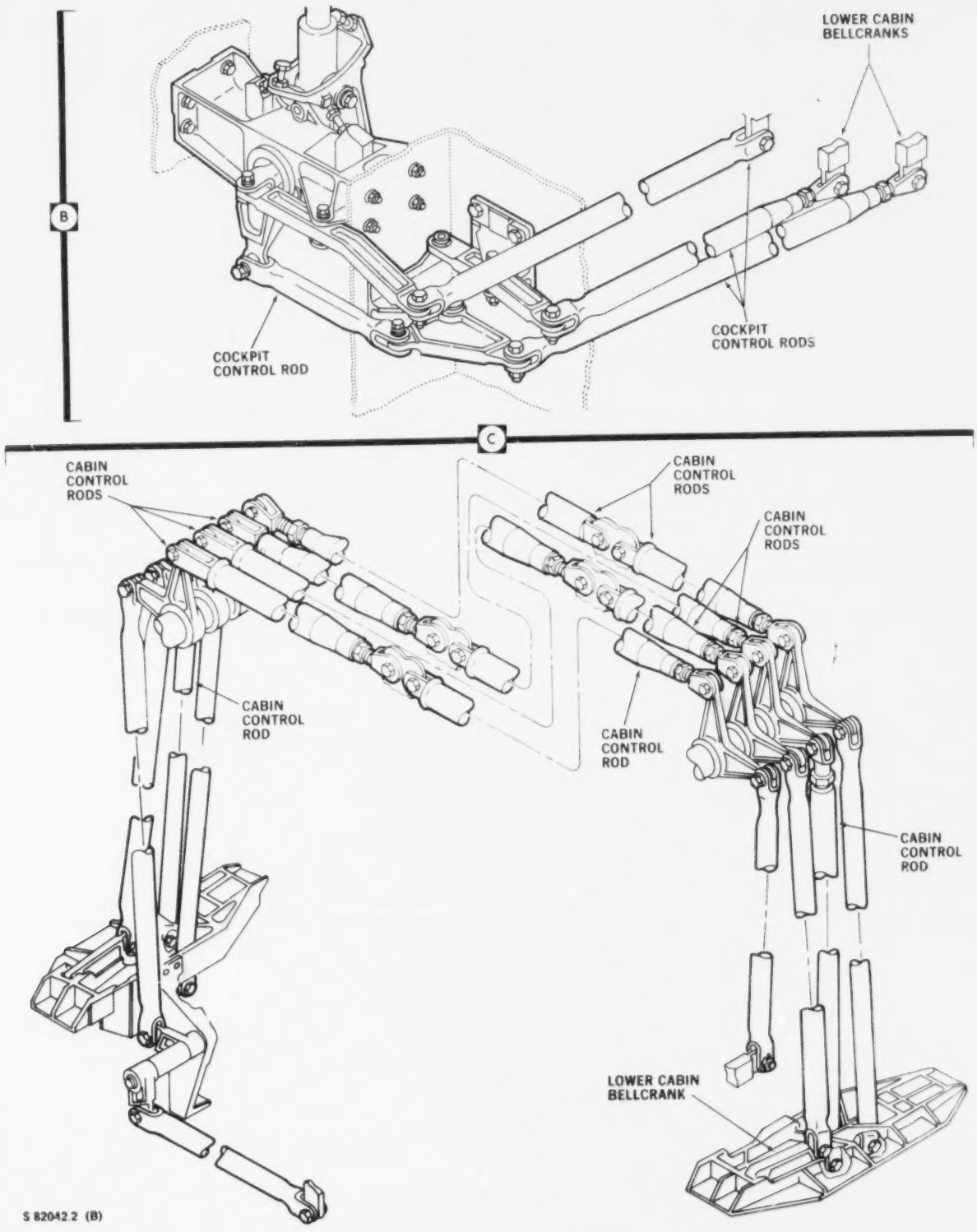


Figure 10-1 (Sheet 2 of 4)

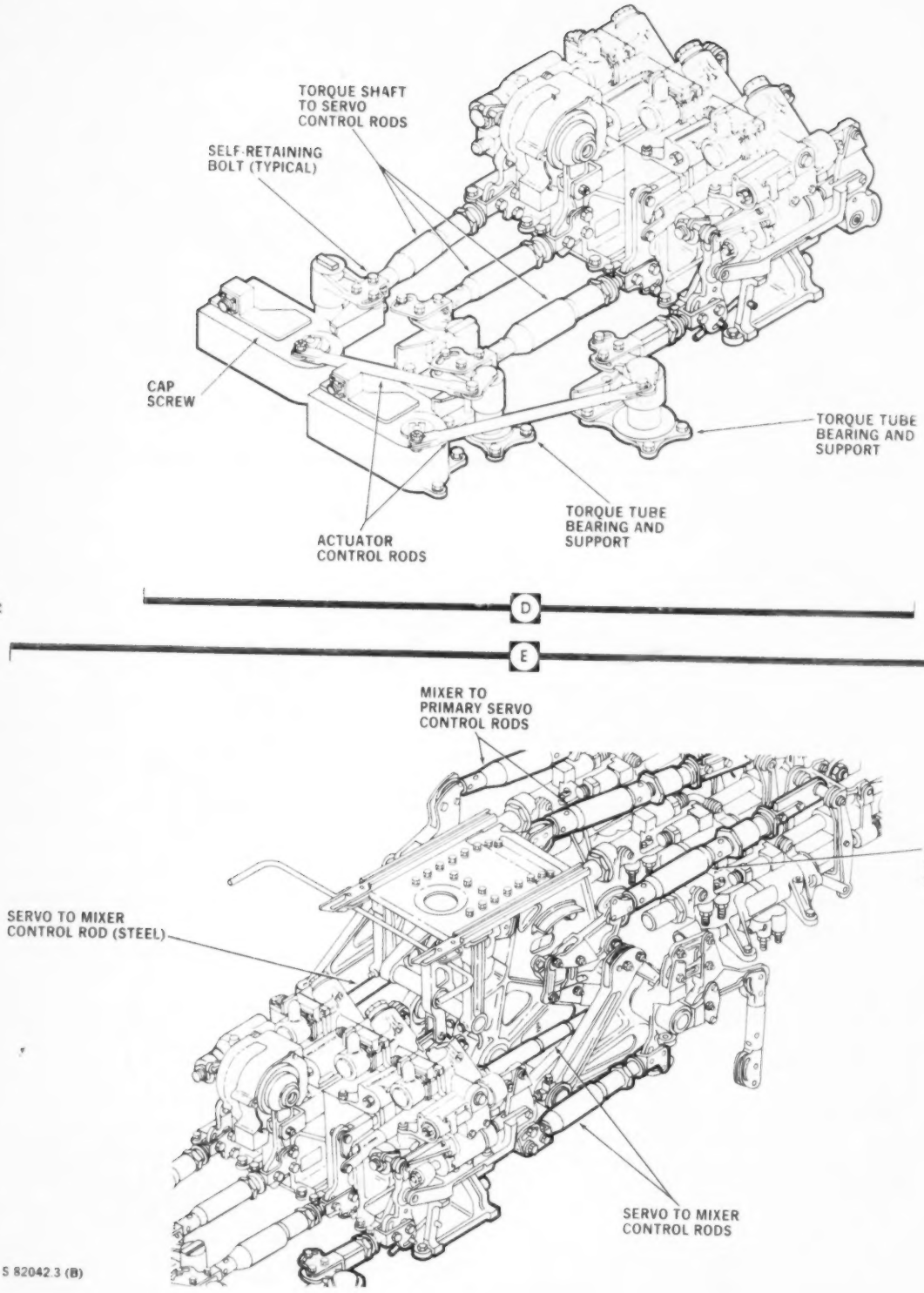

TORQUE SHAFT TO SERVO CONTROL RODS
SELF-RETAINING BOLT (TYPICAL)
CAP SCREW
TORQUE TUBE BEARING AND SUPPORT
TORQUE TUBE BEARING AND SUPPORT
ACTUATOR CONTROL RODS
D
E
MIXER TO PRIMARY SERVO CONTROL RODS
MIXER TO PRIMARY SER CONTROL RO
SERVO TO MIXER CONTROL ROD (STEEL)
SERVO TO MIXER CONTROL RODS
S 82042.3 (B)

Figure 10-1 (Sheet 3 of 4)

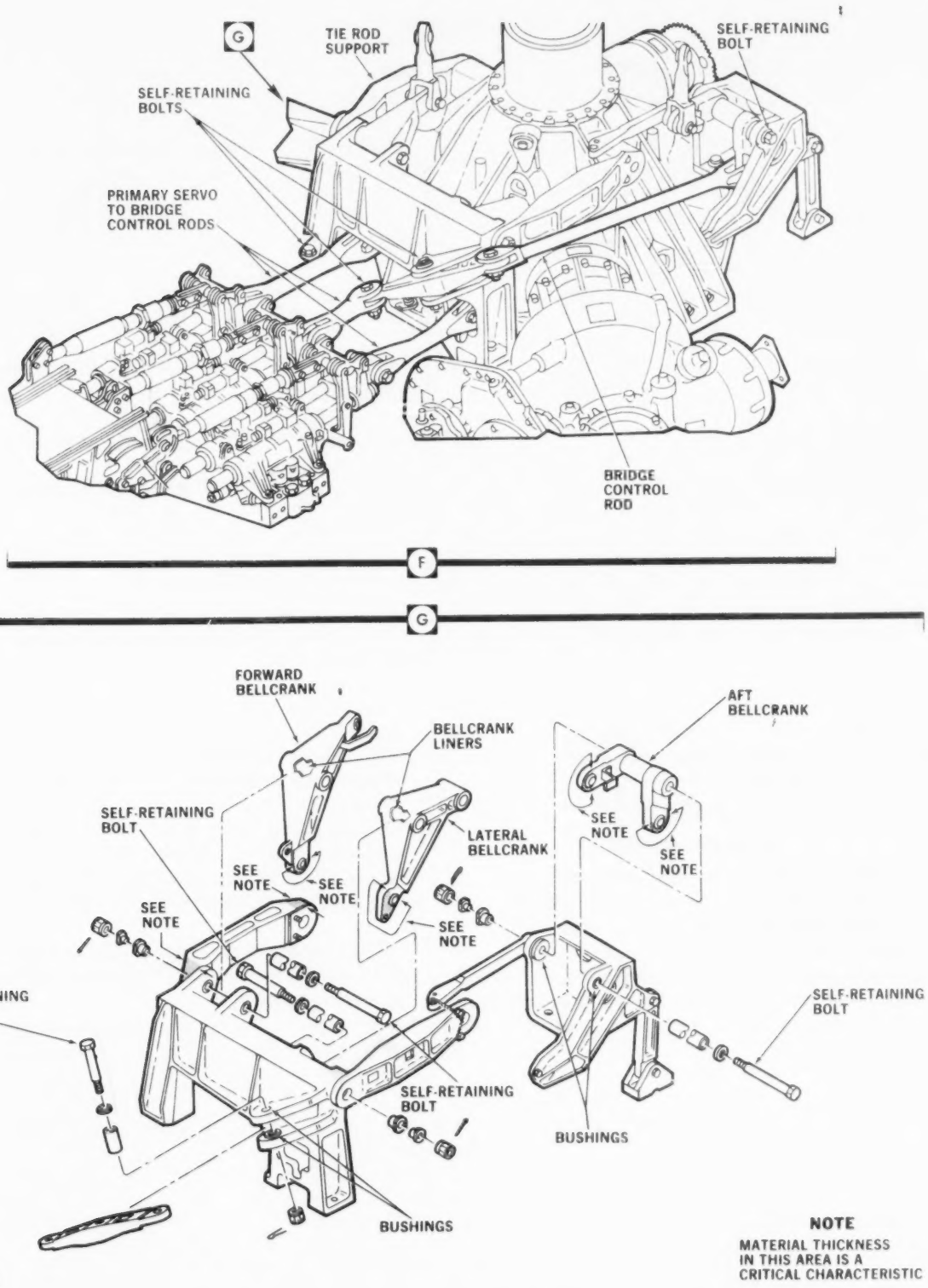
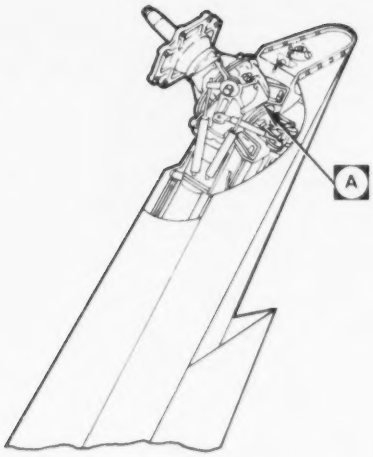
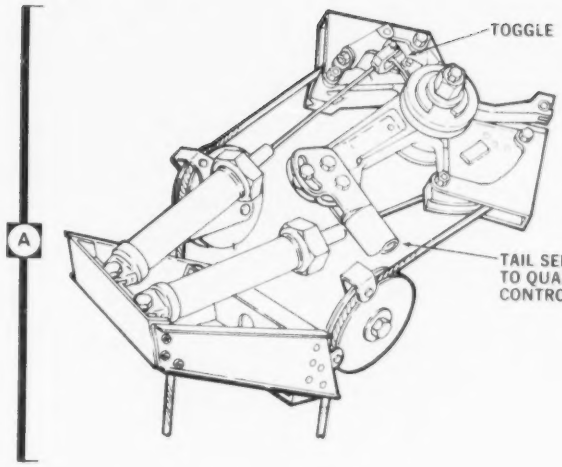


Figure 10-1 (Sheet 4 of 4)





S 82043 (B)

Figure 10-2

10.5. Corrosion removal/treatment:

WARNING

To avoid flight control failure, do not attempt to repair areas where critical characteristics will be affected by repair.

Remove loose corrosion from exterior surfaces of flight control components using procedures in TM 43-0105. Remove corrosion from internal bores of fli control rods, using small arms cleaning equipment.

10.6. Sealants: There is no special sealing required corrosion control in this system. Refer to TM 55-15 237-23-8 for sealing procedures when removing a replacing components in the flight control system.

10.7. Finishes: Refer to TM 55-1520-237-23-10 a TB 746-93-2 for information on paint touchup of fli control system.

Table 10-1. Corrosion Inspection

Index No.	Area/Item Nomenclature	Material Identification	Corrosion Appearance	Probable Cause
1	Cockpit control rod	2024-T42 WW-T-700-3	Bubbling of paint, white dust	Moisture inside rod
2	Cockpit control rod	2024-T42 WW-T-700-3	Bubbling of paint, white dust	Moisture inside rod
3	Cabin control rod	2024-T42 WW-T-700-3	Bubbling of paint, white dust	Moisture inside rod
4	Actuator control rods	2024-T42 WW-T-700-3	Bubbling of paint, white dust	Environmental
5	Torque tube bearing	Cad-plated steel		
6	Torque tube bearing support	7075-T73 QQ-A-367	Bubbling of paint, white dust	Environmental
7	Self-retaining bolt SS27578	Cadmium-plated (0.0003 in. thick)	Red film, pits	Environmental
8	Cap screws on trim actuators	Alloy steel cadmium-plated (0.0003 in. thick)	Red film, pits	Environmental
9	Torque shaft to servo control rods	2024-T42 WW-T-700-3	Bubbling of paint, white dust	Moisture inside rod
10	Servo to mixer control rods	2024-T42 WW-T-700-3	Bubbling of paint, white dust	Moisture inside rod
11	Servo to mixer control rod	4130 steel MIL-T-6736	Red film, pits	Moisture inside rod
12	Mixer to primary servo control rods	2024-T42 WW-T-700-3	Bubbling of paint, white dust	Moisture inside rod
13	Primary servo to bridge control rod	Steel forgings 4340 NORM and TEMP MIL-S-8844	Red film, pits	Environmental
14	Bridge control rod	Steel forging 4340 NORM and TEMP MIL-S-8844	Red film, pits	Environmental
15	Tie rod support	Forging, 7075-T73 QQ-A-367		Environmental
16	Self-retaining bolts 70400-08159	CRES steel 17-4 PH PMS 5643	Reddish brown tarnish	Environmental

Table 10-1. Corrosion Inspection (Cont)

Index No.	Area/Item Nomenclature	Material Identification	Corrosion Appearance	Probable Cause
17	Bellcrank liners 70400-08157	17-4 PH CRES AMS 5643	Reddish brown tarnish	Environmental
18	Aft bellcrank	4340 steel, ANL MIL-S-5000	Red film, pits	Environmental
19	Bushings, SS4045 and 70400-08107-110	4130 Cond C steel MIL-S-6758 Cadmium-plated (0.0003 in. thick)	Red film, pits	Environmental
20	Toggle	4130 Cond N steel (MIL-S-6758) Chrome- and cadmium-plated	Red film, pits	Environmental
21	Tail servo to quadrant control rod	4130 steel MIL-T-6736	Red film, pits	Environmental

Table 10-2. Corrosion Removal and Repair

Index No.	Area/Item Nomenclature	Damage Limit	Repair Procedure
1	Cockpit control rod	See paragraph 10.3	Remove loose corrosion manually; then apply corrosion removing compound, MIL-C-10578, Type II
2	Cockpit control rods	See paragraph 10.3	Remove loose corrosion manually; then apply corrosion removing compound, MIL-C-10578, Type II
3	Cabin control rods	See paragraph 10.3	Remove loose corrosion manually; then apply corrosion removing compound, MIL-C-10578, Type II
4	Actuator control rods	See paragraph 10.3	Remove loose corrosion manually; then apply corrosion removing compound, MIL-C-10578, Type II
5	Torque tube bearing MKP-21 BS	See TM 55-1520-237-23-8	Remove loose rust manually; then wipe with cloth dampened with corrosion removing compound, MIL-C-10578, Type II
6	Torque tube bearing support	Pits greater than 0.030 inch	Remove loose corrosion manually; then apply corrosion removing compound, MIL-C-10578, Type II
7	Self-retaining bolts SS27578	Pits greater than 0.010 inch, uniform reduction of unthreaded shank diameter greater than 0.001 inch	Remove rust manually; then apply corrosion removing compound, MIL-C-10578, Type II
8	Cap screws on trim actuators	Visible pits after clean up	Remove loose rust manually; then apply corrosion removing compound, MIL-C-10578, Type II
9	Torque shaft to servo control rod	See paragraph 10.3	Remove loose corrosion manually; then apply corrosion removing compound, MIL-C-10578, Type II
10	Servo to mixer control rod	See paragraph 10.3	Remove loose corrosion manually; then apply corrosion removing compound, MIL-C-10578, Type II
11	Servo to mixer control rod	See paragraph 10.3	Remove loose rust manually; then apply corrosion removing compound, MIL-C-10578, Type II
12	Mixer to primary servo control rod	See paragraph 10.3	Remove loose corrosion manually; then apply corrosion removing compound, MIL-C-10578, Type II

Table 10-2. Corrosion Removal and Repair (Cont)

Index No.	Area/Item Nomenclature	Damage Limit	Repair Procedure
13	Primary servo to bridge control rod	See paragraph 10.2.2	See paragraph 10.2.2
14	Bridge control rod	See paragraph 10.3	Remove loose rust manually; then apply corrosion removing compound, MIL-C-10578, Type II
16	Self-retaining bolts 70400-08159	Pits more than 0.010 inch, uniform reduction of unthreaded shank diameter more than 0.001 inch	Remove corrosion manually
17	Bellcrank liners 70400-08157		Clean with pad, NSN 7920-00-659-9175
18	Aft bellcrank	Pits greater than 0.040 inch	Remove loose rust manually; then apply corrosion removing compound, MIL-C-10578, Type II
19	Bushings, SS4045 and 70400-08107-110	Pits greater than 0.030 inch, and/or covering more than 50% of bore area	Remove loose rust manually; then apply corrosion removing compound, MIL-C-10578, Type II
20	Toggle	Pits greater than 0.030 inch	Remove loose rust manually; then apply corrosion removing compound, MIL-C-10578, Type II
21	Tail servo to quadrant control rod	See paragraph 10.3	Remove loose rust manually; then apply corrosion removing compound, MIL-C-10578, Type II

Table 10-3. Sealant System

Index No.	Area/Item Nomenclature	Repair Procedure
5	Torque tube bearing	Coat bearing with corrosion removing compound, MIL-C-16173, Type I
16	Self-retaining bolts	Coat bolt with corrosion removing compound, MIL-C-16173, Type II
19	Bushings, SS4045 and 70400-08107-110	Coat bores with corrosion removing compound, MIL-C-16173, Type II

Table 10-4. Finish System

Index No.	Area/Item Nomenclature	Material Identification	Original Pretreatment	Touchup Repair or Repair Pretreatment	Primer	Top Coat
1	Cockpit control rod	2024-T42 WW-T-700-3	Anodize MIL-A-8625	Alodine	MIL-P-23377	
2	Cockpit control rod	2024-T42 WW-T-700-3	Anodize MIL-A-8625	Alodine	MIL-P-23377	
3	Cabin control rods	2024-T42 WW-T-700-3	Anodize MIL-A-8625	Alodine	MIL-P-23377	
4	Actuator control rod	2024-T42 WW-T-700-3	Anodize MIL-A-8625	Alodine	MIL-P-23377	
6	Bearing support	7075-T73 QQ-A-367	Anodize MIL-A-8625	Alodine	MIL-P-23377	
8	Cap screws	Alloy steel	None		MIL-P-23377	
9	Torque shaft to servo control rod	2024-T42 WW-T-700-3	Anodize MIL-A-8625	Alodine	MIL-P-23377	
10	Servo to mixer control rod	2024-T42 WW-T-700-3	Anodize MIL-A-8625	Alodine	MIL-P-23377	
11	Servo to mixer control rod	4130 steel MIL-T-6736	Cad plate QQ-P-410	None	MIL-P-23377	
12	Mixer to primary servo control rod	2024-T42 WW-T-700-3	Anodize MIL-A-8625	Alodine	MIL-P-23377	
13	Primary servo to bridge control rods	4340 steel MIL-S-8844	Cad plate QQ-P-410	None	MIL-P-23377	
14	Bridge control rod	4340 steel MIL-S-8844	Cad plate QQ-P-410	None	MIL-P-23377	
15	Tie rod support				MIL-P-23377	MIL-C-46168
18	Aft bellcrank	4340 steel MIL-S-8844	Cad plate QQ-P-410	None	MIL-P-23377	None
20	Toggle	4130 steel MIL-S-6758	Cad-plate MIL-STD-865	None	MIL-P-23377	MIL-C-46168
21	Servo to quadrant control rod	4130 steel MIL-S-6736	Cad-plate QQ-P-410	None	MIL-P-23377	MIL-C-46168

Appendix A

REFERENCES

TB 746-93-2	Painting and Marking of Army Aircraft
TM 43-0105	Corrosion Control for Army Aircraft
TM 55-1500-333-24	Cleaning Procedures for Army Aircraft
TM 55-1520-237-23-4	Servicing, Ground Handling, Air Transportability, and General Maintenance Task Manual
TM 55-1520-237-23-7	Powertrain Maintenance Task Manual
TM 55-1520-237-23-8	Hydraulics and Flight Controls Maintenance Task Manual
TM 55-1520-237-23-10	Structural Repair Maintenance Task Manual

Appendix B

SPECIAL EQUIPMENT LIST

Item	Spécification (If Available)	Stock Number or Part No.	Source	Intended Use
Engine borescope		21C7190P02		Inspect interior of flight control rods

Appendix C

CONSUMABLE MATERIALS

Item	Specification	National Stock Number	Unit of Issue	Source	Intended Use
1	L-P-50	7920-00-659-9175	ea		Remove corrosion
2	P-C-451, 320-grit	5350-00-161-9715	pg		Remove corrosion
3	MIL-C-10578, Type II	6850-01-081-1689			Remove corrosion, prepare surface
4	MIL-S-8802	8030-00-753-5008	kt		Sealing compound
5	MIL-P-23377 (Alternate Fed. Spec TT-P-1757)	8010-00-082-2450	kt		Touch up and protect reworked area
6	MIL-C-46168	8010-01-131-6255	kt		Touch up paint
7	DOD-L-25681	9150-00-543-7220	lb		Protect pins
8	P-C-451	5350-00-246-0330	pg		Clean surfaces
9	MIL-C-85054, Type I	8030-01-041-1596	cn		Protect surfaces against corrosion
10	TT-M-261	6810-00-281-2875	1/2 gl		Clean surfaces
11	O-T-620	6810-00-678-4418	gl		Degrease surfaces prime prepared surfaces
12	MIL-L-23699	9150-00-985-7099	qt		Corrosion prevention
13	MIL-C-16173, Type II	8030-00-231-2345	cn		Corrosion prevention
14	TT-P-1757	8010-00-582-5318	qt		Prime prepared surfaces

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Callout 16 on figure 4-3 is pointing at a bolt. In key to figure 4-3, item 16 is called a shim - Please correct one or the other.

I ordered a gasket, item 19 on figure B-16 by NSN 2910-00-762-3001. I got a gasket but it doesn't fit. Supply says I got what I ordered, so the NSN is wrong. Please give me a good NSN

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TM 55-1520-237-23-11	13 May 85	Aircraft Corrosion Control Manual UH-60A Helicopter

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The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 dekagram = 10 grams = .35 ounce
1 hectogram = 10 dekagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*
inches	centimeters	2.540
feet	meters	.305
yards	meters	.914
miles	kilometers	1.609
square inches	square centimeters	6.451
square feet	square meters	.093
square yards	square meters	.836
square miles	square kilometers	2.590
acres	square hectometers	.405
cubic feet	cubic meters	.028
cubic yards	cubic meters	.765
fluid ounces	milliliters	29,573
pints	liters	.473
quarts	liters	.946
gallons	liters	3.785
ounces	grams	28.349
pounds	kilograms	.454
short tons	metric tons	.907
pound-feet	newton-meters	1.356
pound-inches	newton-meters	.11296

To change	*To*	*Multiply by*
ounce-inches	newton-meters	.007062
centimeters	inches	.394
meters	feet	3.280
meters	yards	1.094
kilometers	miles	.621
square centimeters	square inches	.155
square meters	square feet	10.764
square meters	square yards	1.196
square kilometers	square miles	.386
square hectometers	acres	2.471
cubic meters	cubic feet	35.315
cubic meters	cubic yards	1.308
milliliters	fluid ounces	.034
liters	pints	2.113
liters	quarts	1.057
liters	gallons	.264
grams	ounces	.035
kilograms	pounds	2.205
metric tons	short tons	1.102

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C